diesel power

January 1961

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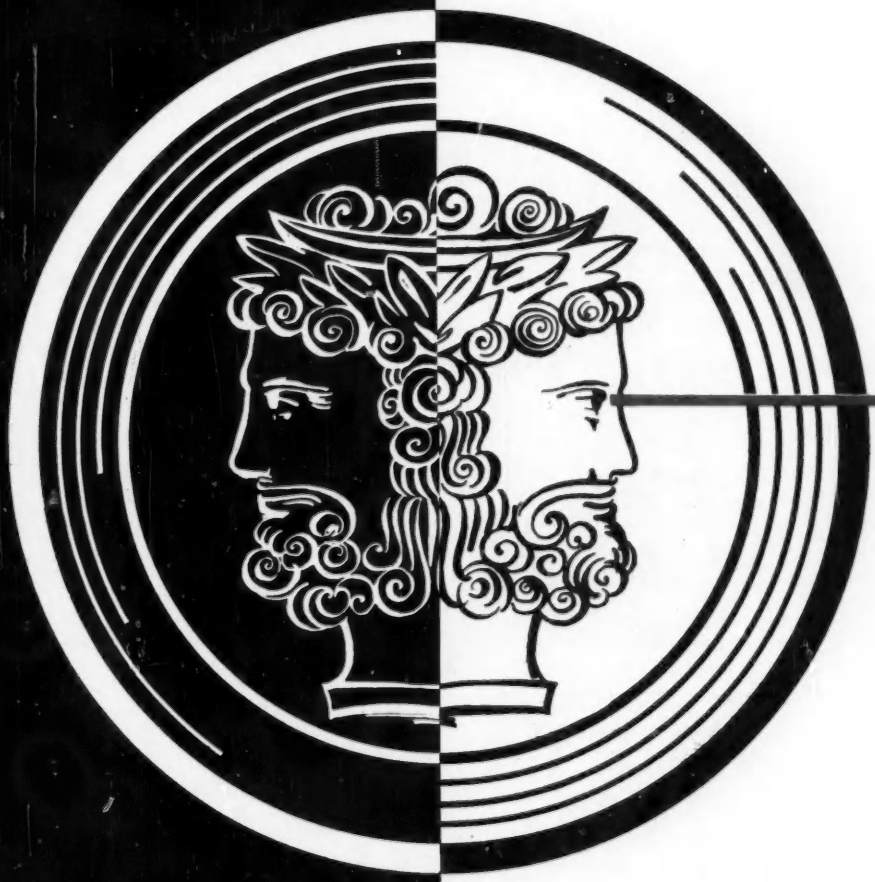

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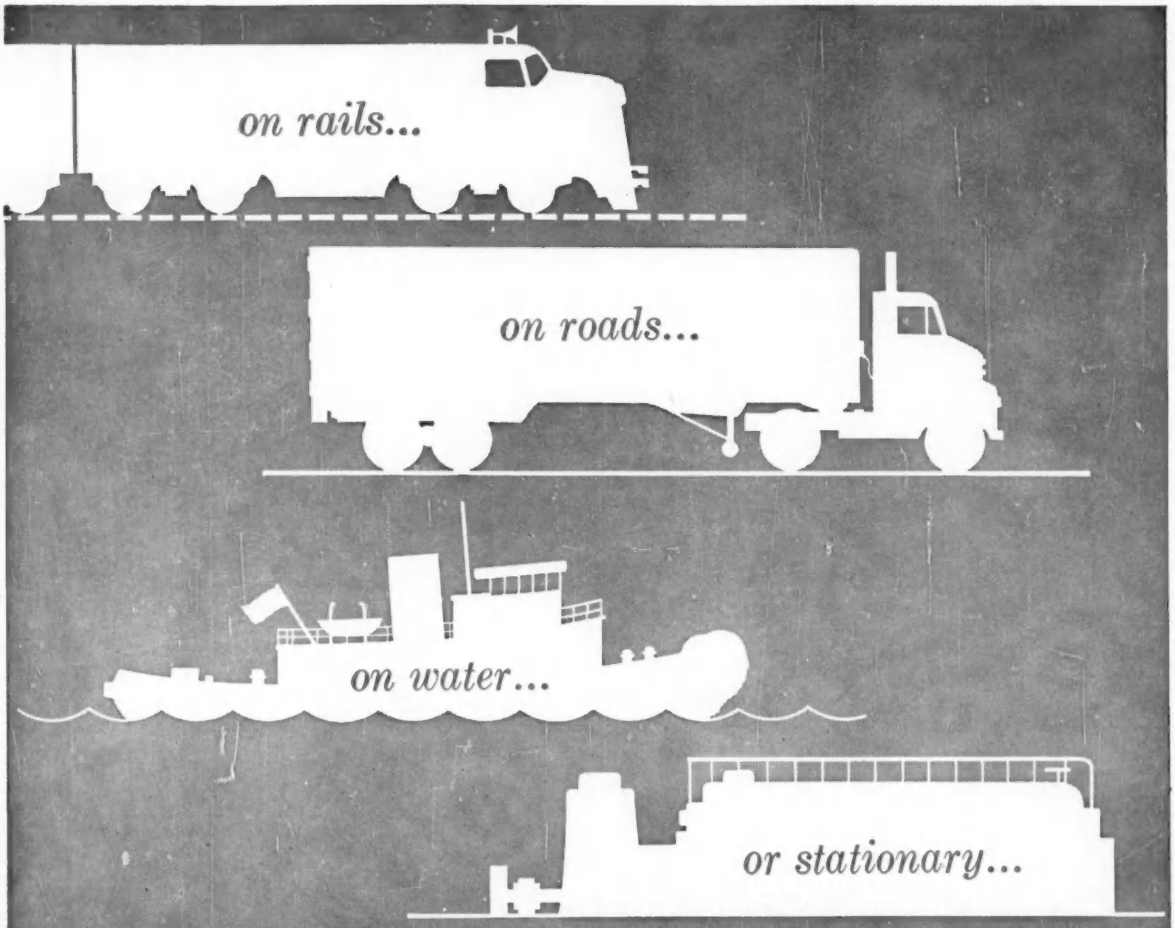

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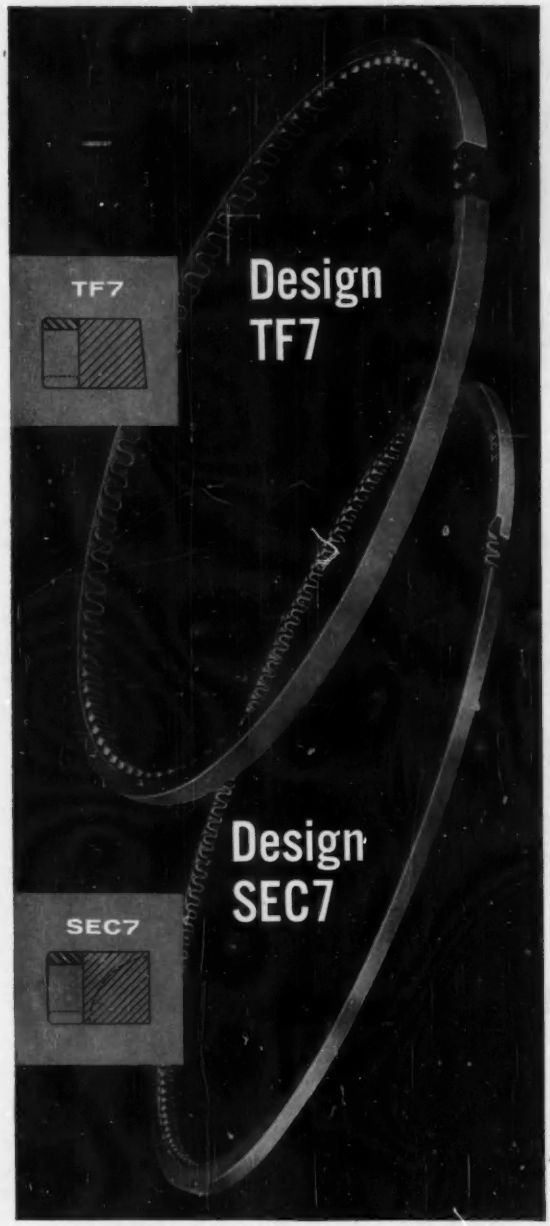

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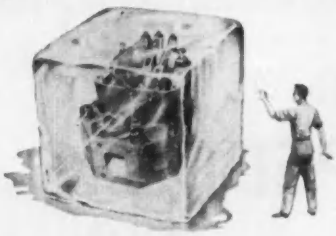

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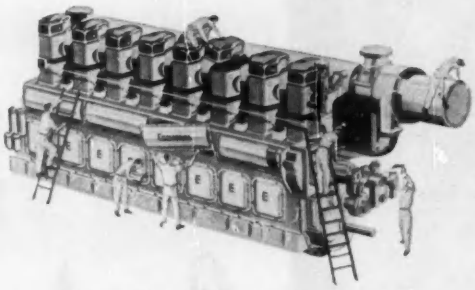

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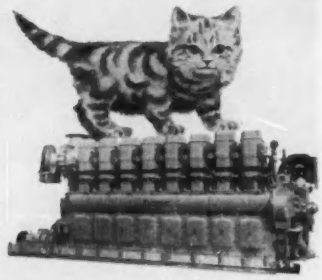

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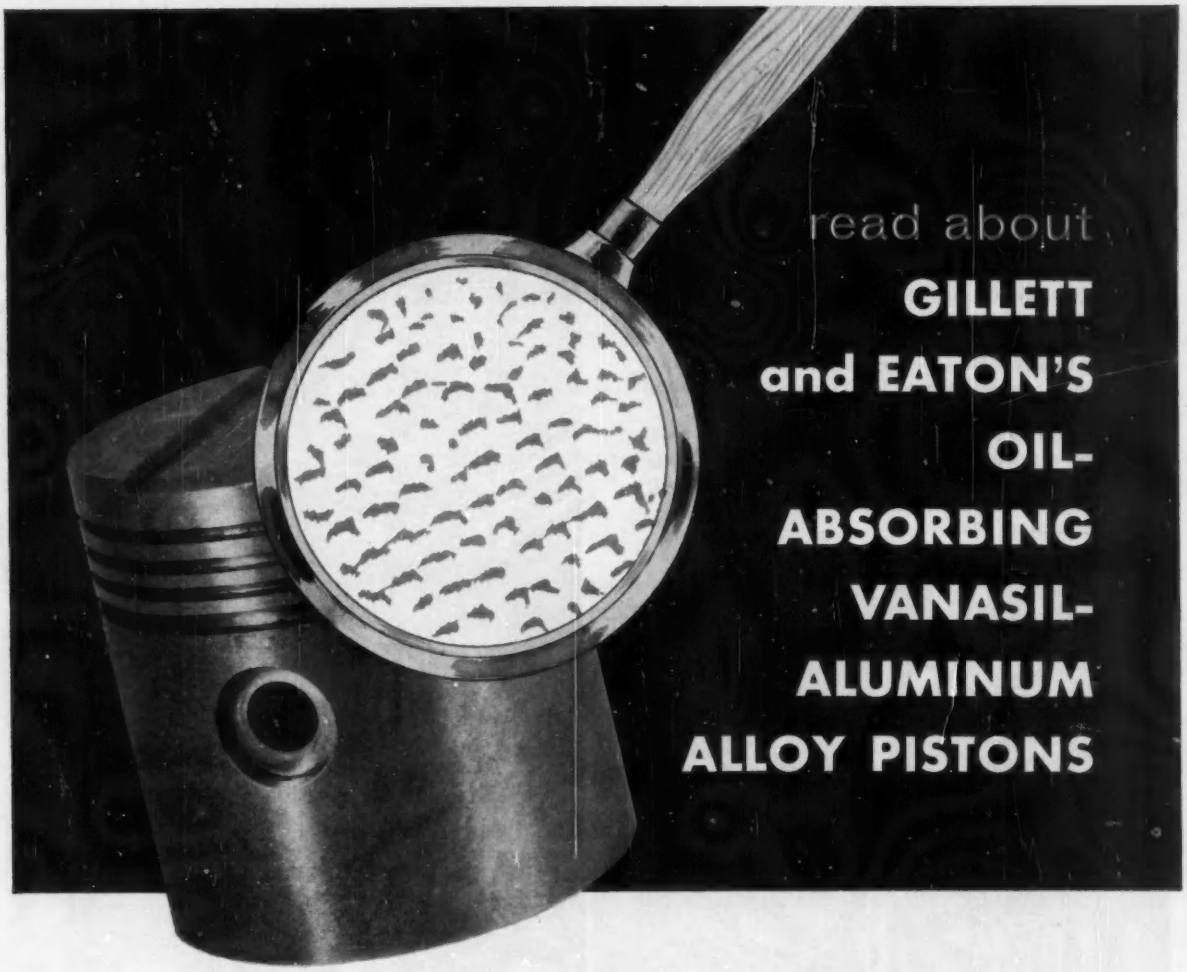

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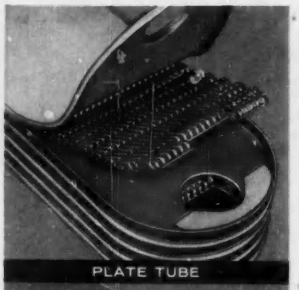
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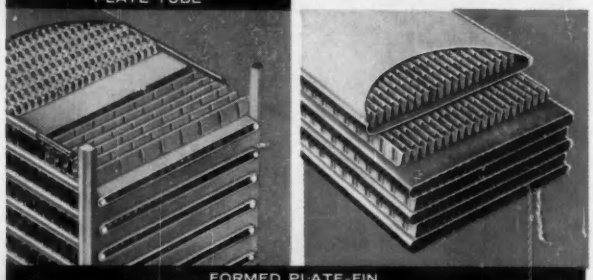
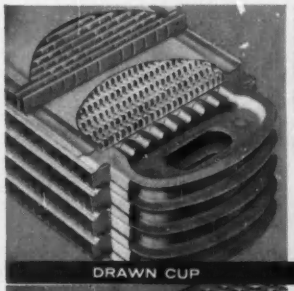
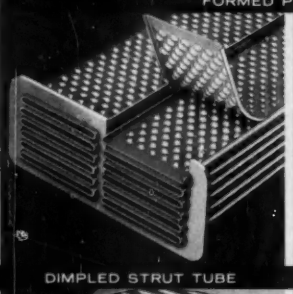
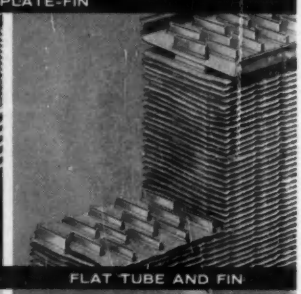
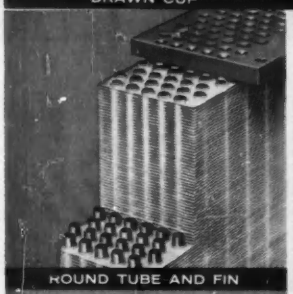

FORMED PLATE-FIN

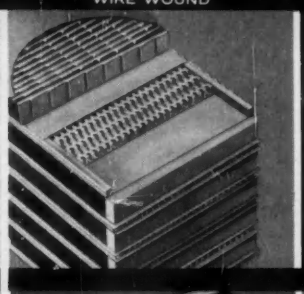

DRAWN CUP

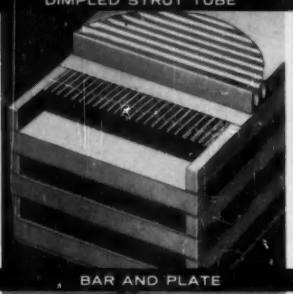
WIRE WOUND

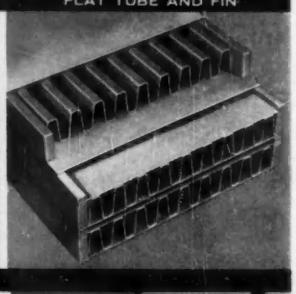

DIMPLED STRUT TUBE

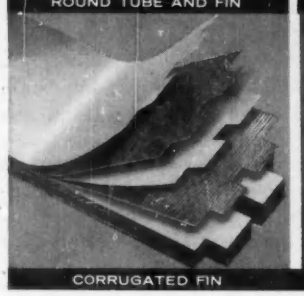

FLAT TUBE AND FIN

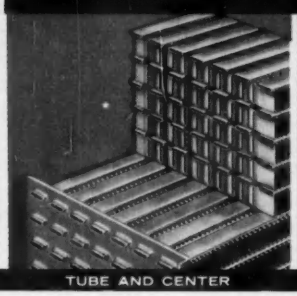

ROUND TUBE AND FIN

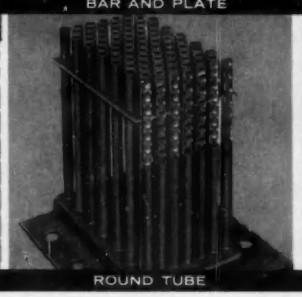



BAR AND PLATE




CORRUGATED FIN


TUBE AND CENTER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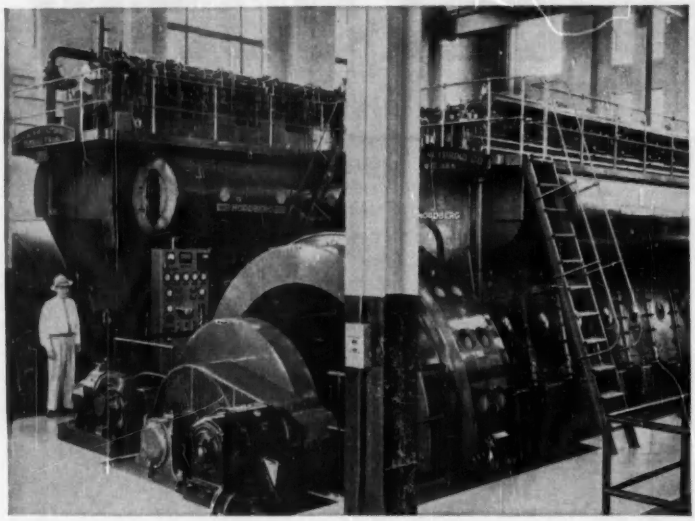

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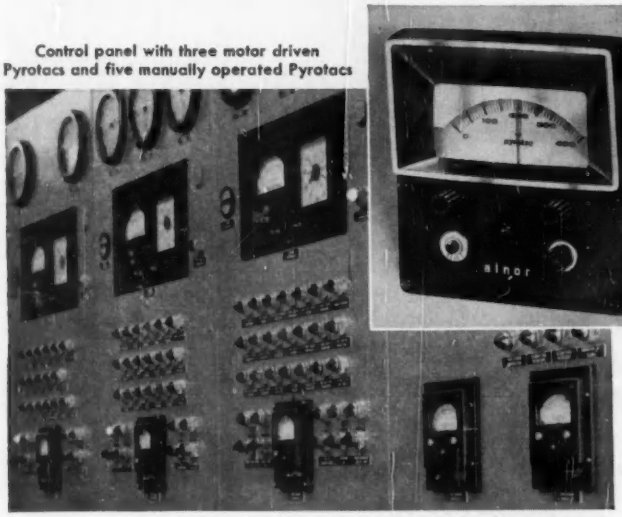

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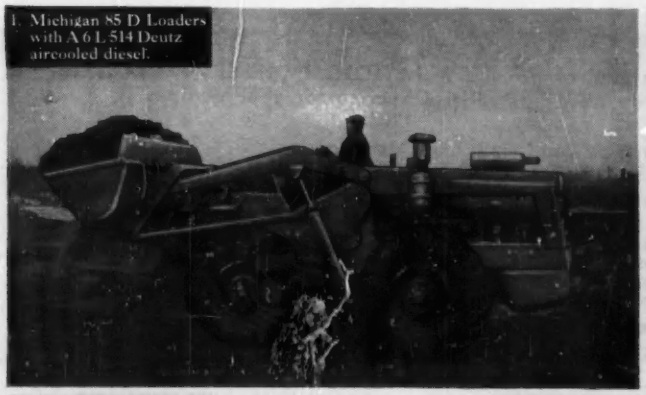
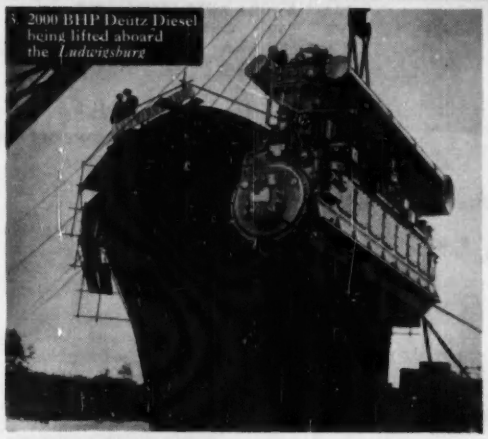
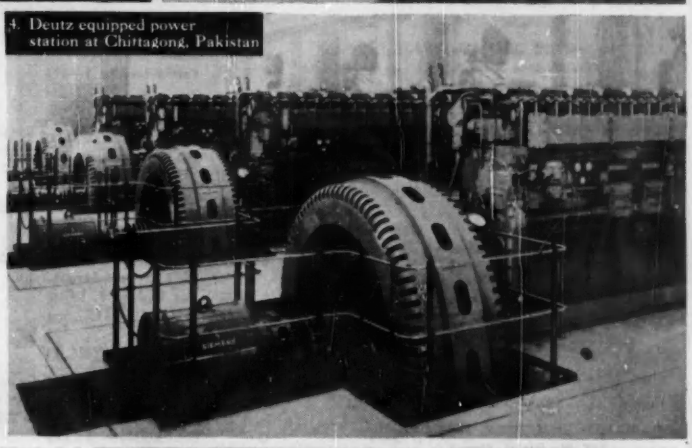


1. Michigan 85 D Loaders with A 6 L 514 Deutz aircooled diesel.

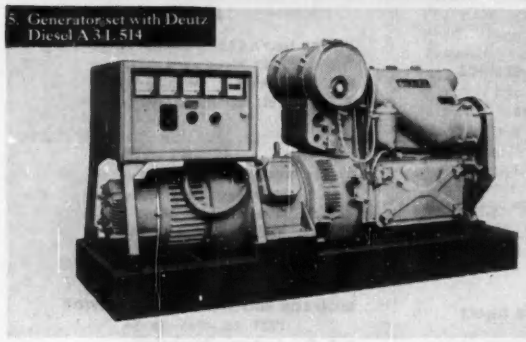
2. Bros Vibro Pactor with Deutz A 2 L 514



3. 2000 BHP Deutz Diesel being lifted aboard the *Ludwigsburg*



4. Deutz equipped power station at Chittagong, Pakistan



5. Generator set with Deutz Diesel A 3 L 514

6. Deutz driven Young ore carrier

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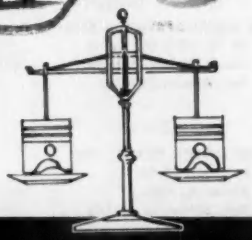

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diesel power

editorially speaking

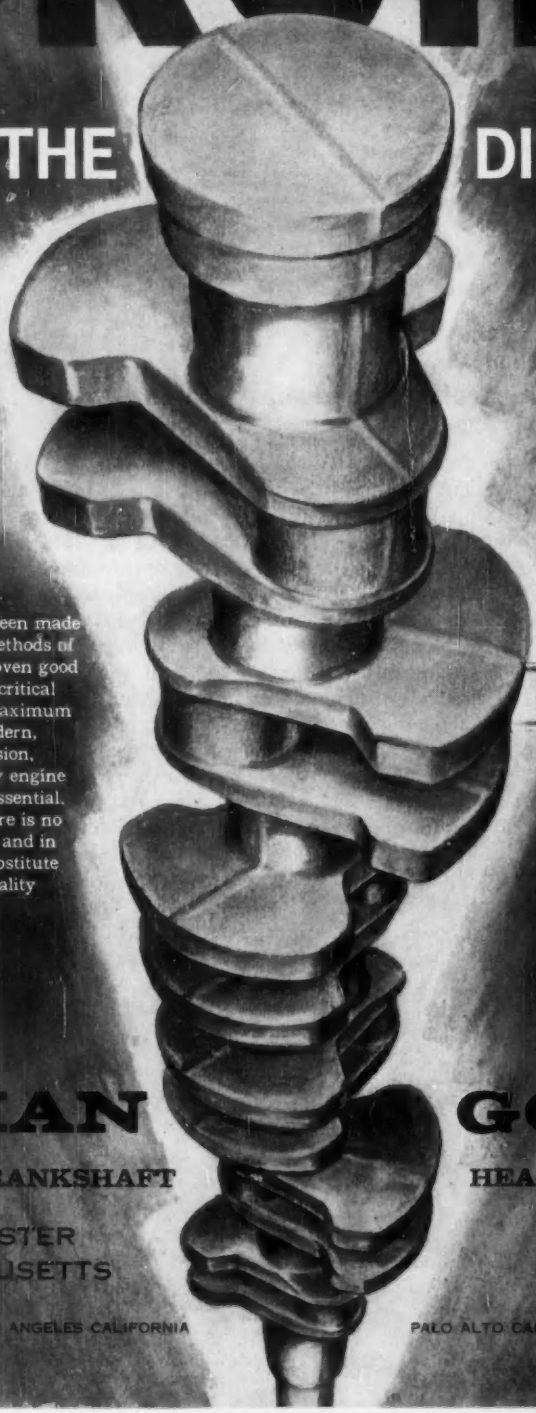
Storehouse, granary or depot . . .

By original definition, a "magazine" was "a place where goods or supplies are stored" . . . a storehouse, granary or depot where you kept buttons, barley or bullets. Well down on the list of Webster's definitions a "magazine" became a "storehouse of information on any subject". Today, this is the broadest meaning, implying a paper-bound periodical published at stated intervals, circulated and read. Business magazines such as DIESEL POWER fit both the original definition and the commonly-accepted meaning, being a storehouse, specifically of information. But a new meaning and function has been added. The storehouse is not static; it's a dynamic means of business and technical communication . . . your best source of current knowledge and ideas that you can put to work. True importance of business magazines is not in their physical properties. It lies in the fact that they are a living force that touches our business life in many ways. They reach the minds, hearts and imagination of their readers. They provide facts, offer ideas. They affect judgements and help make sound decisions possible. In many cases they break down barriers of seeming impregnability. For 38 years, we have followed the best principles of business journalism, serving the interests of our readers and promoting the Diesel Industry. In the years ahead we plan to continue, constantly aiming at doing a better job in conformance with the highest concept of good, responsible business journalism.

G. Renfrew Brighton, Publisher

FORGING

MAKES THE DIFFERENCE



Crankshafts have been made successfully by other methods of fabrication and have proven good enough for certain non-critical applications—but for maximum dependability of the modern, compact, high-compression, high-torque, heavy-duty engine a forged crankshaft is essential.

In a crankshaft there is no substitute for a forging, and in a forging there is no substitute for Wyman-Gordon quality and experience.

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For more information write in No. 408

diesel power highlights

NATIONWIDE TURNOUT AT FLEET MAINTENANCE EXPOSITION . . .

Private Truck Council of America's recent (Dec. 5-8) exposition at NYC's Coliseum was well attended by truck, bus and car fleet operators. Workshop session and off-the-record seminars on maintenance problems and procedures were extremely popular. Dates for this year's exposition are set for Oct. 23-27, to be held again in Manhattan's Coliseum.

MORE DIESELS DOWN ON THE FARM . . .

US Dept. of Commerce's Bureau of Census reports in last month's "Current Industrial Reports" that farm tractors from January to October 1960 (except garden tractors) are definitely going diesel. Wheel-type farm tractors alone are 41% diesel–and this doesn't include agricultural track-laying types of which about 70% are diesel-powered. The farm market keeps getting bigger and bigger every year! Figure for all types of track-laying tractors is 80% diesel; for shovel-loaders, 71.5%. That's a total of 66,078 engines involved.

FOOLPROOF REEFER HEAT LOSS DETERMINATION . . .

US Dept. of Agriculture and National Bureau of Standards have come up with a method of determining the heat transfer rate of your refrigerated trailer. Means that operators can now install the correct cooling equipment—neither too big nor too small—to adequately protect the fresh and frozen foods he's hauling. Free copy of report "A Rating Method For Refrigerated Trailer Bodies Hauling Perishable Foods", Marketing Research Report No. 433, is available from Office of Information, US Department of Agriculture, Washington 25, D. C.

SAN ANTONIO SCENE OF ADS's SPRING MEETING . . .

Semi-Annual meeting of Association of Diesel Specialists takes place in Texas next month. Date is February 23 through 26—place is San Antonio's Granada Hotel and Inn. There'll be a tour and lunch at one of US's outstanding research institutes — Southwest Research Institute—where a good deal of work is being performed on the latest diesel-powered equipment. There'll be interesting exhibits of latest products . . . speakers . . . technical programs . . . and the manufacturers seminar that proved so popular last meeting. Promises to be even bigger and better than last year's Chicago meeting. (Naturally, it's in Texas, isn't it!)

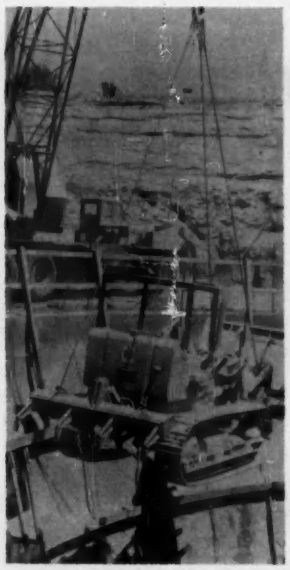
EMPHASIS ON STOPPING . . .

Trucks and buses are fast running out of brakes and braking surface to take care of the additional loads and speeds required of today's transportation. One answer to the problem is retarders—both exhaust, electric and hydraulic. Thompson Ramo Wooldridge is in the picture with a new hydraulic retarder . . . Parkersburg, Rig & Reel has the Hydrotarder . . . Wagner is also in the picture as is Lear with a new electric retarder . . . and Power Brake Equipment has Williams' exhaust compressor brake . . . Borg-Warner is getting into the act also with a new hydraulic retarder. And rumor is that a new type of retarder that turns your engine into a compressor will soon be announced. Exhaust brakes are an old story in Europe . . . looks like we'll be catching up fast over here!

diesel power

news section

Atlas Missile Excavation
down Texas way . . . with an International Drott TD-9 Four-in-One dozing dynamited shot-rock at bottom of 180-ft. hole.



Job Done,
she's hoisted back out. It's one of five TD-9's, working on string of Atlas sites.

Arctic Tracks . . .
Ex-Marine Major "Buck" Boyd, technical advisor for Arctic Institute of North America's Devon Island expedition, inspects one of the diesel farm tractors supplied by Massey-Ferguson Limited, Toronto, Canada. Similar-type tractors to these M-F "65's" went along with Sir Edmund Hillary and Dr. Vivian Fuchs to South Pole in '58.

Blowing Up A Storm . . .
Scene is McGuire Air Force Base. Vehicle is ramp-sweeper conducting efficiency tests on Purolator's dry-type filter. Millipore test unit was attached on sweeper hood . . . plastic hoses running to engine manifold and ahead of the air filter. Comparison of test unit discs showed only 0.24% of dirt entering air intake got past Purolator's filter!

NEWS SECTION . . .

Henderson Medals Awarded Chatterton and Sammons

Ernest Chatterton and Herbert Sammons were awarded Henderson medals "In consideration of their outstanding achievements, the invention, design and development of the 'Deltic' Diesel-electric drive for railway locomotives."

Mr. Chatterton, Chief Engineer, Piston Engine Division of D. Napier and Son, until his retirement last year, is responsible for the development of the Deltic Diesel Engine as a practical and useful power plant for many applications, including the Deltic Diesel Locomotive. The Deltic road locomotive of 3300 hp holds the world's record as being the most powerful single power unit and with the lightest power-to-weight ratio. Compared with 15 to 20 lbs per hp for conventional 2-cycle and 4-cycle locomotive diesel engines, it weighs six lb per hp.

Herbert Sammons, Managing Director of D. Napier and Son conceived the basic idea and designed the Diesel engine built in the form of a delta—crankshafts are located at the apex of each angle of an equilateral triangle and operate pistons that oppose each other in each cylinder. Eighteen or more cylinders are possible. First patent was issued to Mr. Sammons in 1951.

They'll Learn All About It!

If you'e working for a public utility company, radio or TV station or hospital or other institution planning to install a standby diesel-electric set for emergency use, better look into the course now being offered by Detroit Diesel, and learn all about it.

A special course on the subject is being offered in addition to the regular service training program, and is being held at the Division's Training School in Detroit.

Each complete course takes two weeks with classes limited to 12 trainees, permitting maximum laboratory participation.

All features of the Series 71 engine, design, disassembly and as-

(Continued on page 16)

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Factory-Certified Exchange Crankshafts give Trouble-Free Operation for the Full Life Cycle of Your Diesel Engine

Morco dealers — coast to coast — are stocked with reconditioned, like-new crankshafts for different diesel engine models. Users of Detroit Diesel and Cummins engines can exchange worn shafts for MORCO factory-reconditioned shafts through authorized dealers.

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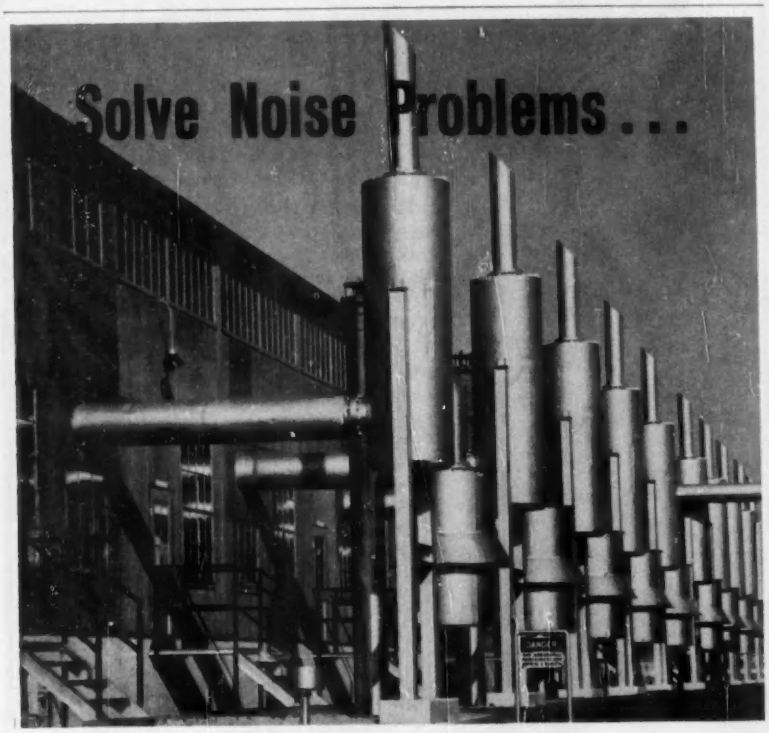
sembly, trouble-shooting, and tune-up procedures are being covered, as well as other pertinent material.

Pump Protection With CALCON Kit

A Ruston & Hornsby diesel engine attached to a Berkeley Pump Co. centrifugal pump uses a modified Model 460 CALCON kit installed for safety and economy. An extra pump pressure sensing unit has been added to this model in case of a broken pipe or lost prime.

The new control units have been developed by California Controls Co. They are designed on the modular system, can be assembled in any combination to provide for sensing of dangerous temperature, pressure and overspeed conditions and actuate any pilot operated valve, switch, warning or other device in the system.



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Construction Equipment Exposition Set for Chicago In February

537,000 square ft of exhibit space has been reserved by CIMA, the Construction Industry Manufacturers Association, in the International Amphitheatre at Chicago for the largest indoor industrial exhibit in the world, The Construction Equipment Exposition and Road Show.

With the signing of the contract in Mayor Daley's office, preliminary arrangements were completed for the show that will bring together for the first time all of the various groups associated with the construction industry as co-sponsors. They are: The American Road Builders' Association, The Associated General Contractors of America, the International Road Federation and the Associated Equipment Distributors.

Opening ceremonies are scheduled for noon on February 23. Numerous Industry activities are scheduled prior and during the Exposition, including the annual Convention of the Associated Equipment Distributors, meetings of the American Road Builders' Association, seminars by the International Road Federation, meeting of the Construction Industry Manufacturers Association, the annual Convention of the National Bituminous Concrete Association and many others.

Simms Tackles Air Pollution

Simms Motor Units, Ltd. has written the Secretary, Ministry of Transport, London, to clarify the progress being made to rid the air of the noxious fumes and black smoke discharged by diesel-engined vehicles.

Simms has pointed out that the company produces a cheat-proof excess fuel device which overcomes this problem. The Simms device prevents drivers from increasing the oil/air mixture in an attempt to obtain greater power. In order to start a cold diesel engine, the Simms letter explains, an amount of fuel is required greater than the normal maximum delivery of the pump by some 50%. The Simms device pro-

vides for this, but it automatically adjusts the mixture to that suitable for ordinary driving as soon as the vehicle is moving. The design prevents any further alteration while the vehicle is running on the road.

The National Society for Clean Air has long been interested in this development which has proved to be remarkably successful in solving a widespread problem. Many diesel-engined vehicles already use the Simms device as standard equipment.

The company has suggested to the Minister that its availability should again be emphasized in view of the present proposal to insert a provision in the Motor Vehicles Regulations which would prevent drivers from operating the excess-fuel device with the idea of providing extra power.

A Diesel's Doing It!

Diesel engine operation at Miami's Alexander Orr, Jr., water treatment plant has written an impressive record over the years. With four 825-hp Worthington engines, 16½-million gallons of water are delivered daily against a total head of 225 ft.

Since 1953 these engines have operated over 50,000 hrs. They averaged 28 gal, fuel oil; 1.19 gal lube oil; and 34½ cents in materials, operation and maintenance per hour of operation.

Education Pays and Pays!

Nearly 600 men have completed Cummins Engine Company's home study training program conducted by Interstate Training Service. The course rates high praise from students and employers alike. Some 5000 students are enrolled.

FPC News

Tabulation of some of the recent applications before the Federal Power Commission for installation of compressor horsepower that have been granted or are now pending:

Company	Compressor Equipment
Hope Natural Gas Clarksburg, W. Va.	one 660 hp three 440 hp
Transcontinental Gas Pipe Line Houston, Texas	25,040 hp in eight existing stations
Texas Eastern Transmission Shreveport, La.	33,710 hp in four existing stations
Algonquin Gas Transmission Boston, Mass.	6,000 hp
Mountain Fuel Supply Salt Lake City, Utah	2,640 hp
Texas Eastern Transmission Shreveport, La.	7,500 hp
Texas Eastern Transmission Shreveport, La.	3,300 hp
Algonquin Gas Transmission Boston, Mass.	8,000 hp
El Paso Natural Gas El Paso, Texas	6,800 hp

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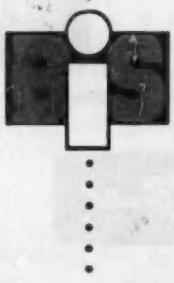
the New *Reliance* CONTROLLER

a tachometer, hour meter and over-speed stop . . . all in one case . . . with only one drive



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diesel power

news—people & plants

R. H. Henry

R. H. Henry a "Veep" At Spray Products

Richard H. Henry has been named vice-president and director of export, Spray Products Corp., according to owners Charles P. Orr and Miles Powell. His area of responsibility includes the development of all export business for the company.

He served with American Express Co. for 14 years, living in several foreign countries, traveling in more. Just prior to joining Spray, he was Manager of Travel with American Express.

New Home For Korfund

Korfund Co. has moved from its Long Island City headquarters to a brand new air-conditioned plant in Westbury, L. I., New York. The new plant is located on Cantiague Road.

At Home . . . in New York! C-B and C-B International in Manhattan Locale

To be within easy access of many of their customers' general offices, Cooper-Bessemer's New York District office and the office of the corporation's International Division have moved into New York's Manhattan business district at 548 Fifth Ave. Approximately 45% of C-B shareholders also have their holdings in N. Y. C-B's former office in that city was at West 43 Street.

J. E. Glidewell

Glidewell to Amot Controls

J. E. ("Speed") Glidewell, formerly vice-president of engineering, Hall-Scott Motors becomes Chief Engineer of Amot Controls Corp., according to Elton B. Fox, president of the firm that manufactures thermostatic valves and controls for the engine industry.

A registered professional engineer, Mr. Glidewell has had a long association with the engine industry as an officer in the SAE.

Mr. Fox has asserted that Mr. Glidewell's association with Amot is in "line with the stepped-up plans for expansion in both manufacturing depth and sales outreach."

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Write for Descriptive Bulletin KTP-50
KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

For more information write in No. 414

More To Talk About . . . Mack's New Hagerstown Plant

Mack's new plant in Hagerstown, Md. will contain a million sq ft of usable floor space, large enough for 22 football fields! The rectangular one-story manufacturing building will turn out all major components for gasoline and diesel engines, transmissions and carriers.

All-weather recessed shipping and receiving areas, equipped with power-operated dock levelers will be built into the plant which will be supplied entirely by truck transportation.

A two-story administration building in contemporary design will contain 60,000 sq ft of space, and an 80,000 sq ft employee facilities structure with a cafeteria equipped to seat 750 at one time.

A modern dispensary, training center and 300-seat auditorium are among the new facilities.

An access road will enter into Martin Road, connected with US Inter-State Highway 81 and US Route 11. Construction is on schedule . . . target, Fall, '61.

C. L. Hastings

American-Standard Acquires Rochester Instrument

Acquisition of **Rochester Manufacturing Co.** by the **Detroit Controls Division of American-Standard** has been made known. It will be operated as a part of the Division which maintains headquarters in Detroit.

Negotiations involving the exchange of about 125,000 shares of American-Standard common stock, have been going on since early Summer.

Rochester Manufacturing has been a leading producer of liquid level, pressure and temperature indication gauges and instruments for industry since 1915. It is expected that the merger with the Detroit Controls Division, an important supplier for 84 years, will result in greater service to industry.

C. L. Hastings, president of Rochester Manufacturing will become a vice president of Detroit Controls. **Warren W. Hastings,** vice-president, will continue to manage production operations.

Cummins Plant Expanding

For the second time in two years, **Cummins Engine Co.,** Columbus, Indiana, is making major additions to its manufacturing facilities.

Plans for a $1,700,000 building to house all engine assembly functions have been announced, with construction starting immediately. The new facilities will provide 101,600 sq ft of additional floor space, bringing the total building area at that site to more than one million sq ft. New building will be the company's second largest single structure, only surpassed by the engine test and shipping area completed in July, 1960.

(*Continued on page 48*)

Looking at 1961

Reviewing facts and factors affecting the direction of diesel industry growth, tracing trends and putting a dimension on the industry for the coming year.

Like Janus on our cover, we will look both ways. We must look backward to see what's been done before we can look ahead. Seeds sown in the past mature in the future. So let's look back at 1960.

Measured by total diesel engine production, it was not a bad year. Our predicted total of 220,300 units was not met. When all figures are in, production will probably fall short by an estimated 10,000 to 15,000 units. Disappointing, perhaps, in view of the optimism engendered by slogans like the "Soaring 60's" but at least it promises to be as good as the previous year.

What Happened?

Newspaper headlines have told the story. But not directly. In our complex and inter-dependent economy, cause is often widely separated from effect and you must trace the pattern to connect them. Take the steel strike for example. Although engine builders did not suffer directly from steel shortages (some bought steel abroad), the strike did affect their business. For example, curtailment of construction involving steel—bridges affecting highway projects for example—idles diesel-powered equipment, making it available for other jobs and reducing the total requirements for diesels.

Take reports of another index of construction activity—housing starts. Starts dropped, particularly in the second half of 1960. Financial pages reported mortgage money shortage and high interest rates as contributing factors. While these might be causes, effects of this drop on the diesel industry were less site preparation, fewer basements to dig, less backfilling and less excavation for utility installation. Carried back into logging and lumbering where many diesels are used, lower lumber requirements meant that fewer diesels could do the job.

Progress of the Highway Program continued to be disappointing. Eventually the work will get done and diesels will do it. But the time factor is the key to how much more diesel-powered equipment will be required. No contractor's equipment works all the time. In fact, many firms could double present work volumes without need for substantial increases in equipment. As originally envisioned, the Program would have far exceeded, on a yearly basis, the capability of present equipment. Thus, it would have created a substantial demand for more diesel-powered equipment. Present stretchouts and programing uncertainly offer little incentive for contractors to buy until they are forced to.

Then we read about a Presidential Election. Invariably, this has a wait-and-see effect on industry. Administration policies can have considerable effect on dif-

DIESELS CURRENTLY IN USE

Railroad	Including Class I, II, III, Terminal & Switching, under-car and refrigeration units	43,973
Bus & Truck	Diesels Currently in Use Buses - 47,957; On-highway trucks - 187,808	235,765
Marine	Including auxiliary power units	48,406
Municipal & Utility	Including electrical power generation, sewage plant use, water pumping, etc.	12,810
Gen. Industry:	Including industrial power applications for electrical power generation, pumping, power drives for saw mills, cotton ginning, rock crushing, general aggregate production, pumping, etc.; emergency standby use	303,767
Petroleum	Including drilling, pumping and pipeline use	62,572
Mining	Including coal, ferrous, non-ferrous and other mining operations	36,158
Construction	Includes all off-highway type equipment used in construction and logging - Trucks, dozers, scrapers, graders, front-end loaders, cranes, shovels, air compressors, generator sets, PTO units	447,763
Agriculture	Includes farm tractors, irrigation and power units	716,549
	TOTAL IN USE -	1,907,763

DIESEL ENGINE PRODUCTION, 1948 - 1961, ALLOCATED TO USING INDUSTRIES

	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960*	1961*	Totals
Railroad	2,299	2,755	3,174	3,200	3,200	2,201	1,171	1,200	1,625	1,630	1,320	1,230	1,100	1,200	27,305
Highway Trans.	15,134	15,452	16,039	20,518	15,836	13,806	13,684	20,569	29,578	28,037	31,491	38,137	42,000	42,000	342,341
Marine	1,296	1,556	1,946	2,243	2,367	2,117	2,290	2,509	2,695	2,770	2,810	2,610	3,200	3,300	33,709
Municipal & Utility	280	307	436	450	462	392	425	431	440	447	470	550	720	1,000	6,810
General Industry	11,763	11,131	12,378	15,146	14,260	12,200	11,200	15,490	16,584	18,658	10,027	14,270	14,660	16,000	194,767
Petroleum	3,184	3,197	3,546	3,650	3,610	4,280	4,310	4,830	5,075	6,620	5,250	4,820	6,000	5,200	63,572
Mining	1,913	1,986	2,317	2,325	2,375	2,635	3,150	3,468	3,925	4,010	4,190	4,660	5,420	5,000	47,374
Construction	24,877	26,342	27,468	28,683	28,110	28,400	28,200	31,700	38,150	52,500	41,500	57,510	59,200	53,000	525,640
Agriculture	64,799	66,825	70,063	73,507	66,154	65,403	55,940	78,293	72,320	63,684	69,700	83,548	88,000	93,000	1,011,236
TOTALS	125,605	129,551	137,367	149,722	136,374	131,434	120,370	159,490	170,392	178,356	166,758	207,335	220,300	219,700	2,252,754

* Estimated

ferent industries and the understandable tendency is to hold off action until the path ahead is seen clearly.

These are a few examples of headline news and how it affected our industry. One caution in interpreting them . . . effects are not always felt immediately. For example, the recent US Department of Commerce decision to authorize federally-assisted highway construction contracts for $718-million in the October-December quarter instead of waiting until the first quarter of 1961 will probably not have any affect on potential equipment purchases until late 1961. Cause and effect may be out of phase.

A Changing Industry

Our industry, today, is far different than it was even ten years ago. Its scope has increased . . . its direction has changed . . . it has benefited by a lot of new thinking since even those composing the industry have changed. This is to be expected if an industry is to stay geared to the times.

During 1960, certain trends and patterns became quite clear. First, you might say that diesels went "international". Second, focus sharpened on diesels as a "vehicular" engine. Third, accent was placed on the low horsepower end of the engine line. Actually, all three items are related and are shaping the future of the industry.

These are the notes of a theme that permits a number of variations. Let's explore a few and put in some overtones.

Diesels Go International

Back in the days when isolationism was practically a national policy, our economy and the products it produced were in line with domestic thinking and needs. As a generalization, the same was true abroad, although some countries being so dependent on exports were a little more, shall we say, cosmopolitan.

With our shrinking world, things have done a flip-flop and, basically, the whole free world is the market place. There's been a growing cross-fertilization of ideas as evidenced by the many licensing agreements. From this side, at least, there has been heavy investment in foreign manufacturing facilities. GM, Caterpillar, International Harvester, Ford, Cummins, among others, are producing overseas.

Most of the diesels and diesel-powered equipment built are for foreign sale, manufacture abroad being cheaper and thus improving the company's competitive position. For some of these diesels are also coming to our shores. For example, Ford is bringing in two diesels built by their British plant. International Harvester is bringing in small diesel farm tractors they build abroad. These will reportedly be followed by a line of small industrial diesels.

Foreign diesel engine and equipment builders are now selling here. There's Mercedes-Benz and Deutz engines, some MAN engines and farm tractors from West Germany; Volvo engines and trucks from Sweden; Burmeister & Wain Alpha engines and Buhk models from Denmark; diesel-powered Leyland, Scammel and Albion trucks from England, Petter and Lister diesels; Yanmar engines from Japan; and others in limited quantities and some we probably don't know about.

Then there are component builders, notably fuel injection equipment manufacturers. Robert Bosch, C. A. V. and Simms not only provide parts and service for their equipment that comes in on foreign-built engines

but they have original equipment accounts (for C.A.V., nozzles only) on American-built engines.

Omission of Perkins engines up to this point has been intentional; discussion of their status leads into an important point. Chrysler's Marine and Industrial Division is now handling distribution, sales and service of these engines in this country and Canada. They have the line of diesels for both OEM and distributor sales with only a few possible exclusions. Conclusion of this agreement with the British firm put the last of the "Big Three" into the diesel business.

Focus on Diesels as Vehicular Engines

Before all this "internationalizing", our diesel industry and that abroad, particularly in Europe, were going quite different and separate ways. Our direction was toward building our so-called high-speed diesels for heavy-duty, relatively high-horsepower applications. For vehicles, this meant contractor-type equipment, big buses and heavy long-haul trucks. With a highly-developed automotive industry building gasoline engines in high volume, and with gasoline plentiful and relatively cheap, these engines were the most economic for the bulk of other vehicular applications.

In Europe, things were different. Both gasoline and distillate were expensive and Europe's economy placed major emphasis on operating costs. Big diesel engine development was intensive but a parallel emphasis was placed on developing the small ones, largely with vehicular use in mind. Result was a crop of small diesels not only suitable for use in automobiles, farm tractors and light trucks of all sizes but actually applied to them.

Acceptance of these engines for vehicular use resulted in a buildup in production, reducing unit cost. This made these engines even more attractive since they could be amortized through savings that much faster. Some production figures by our standards are tremendous. Perkins, for example, has capacity to produce more engines per year than our entire industry—and is expanding.

Vehicular use, then, and particularly in the smaller trucks, soaks up the bulk of European diesel engine production. Other services reap the benefits of the high volume. If we confine discussion to trucks alone, all sizes, we have just about the opposite picture in this country. We total about 10,800,000 registered trucks of 6000 GVW and above. Of these, 1.6% are diesel-powered! In England and West Germany with a total of about 2,250,000 registered trucks, better than 50% are diesel-powered at the 6000 GVW and above this, nearly 100%! What a potential diesel market with our truck volume.

Surprisingly enough, if we now broaden the discussion to include farm tractors, mobile off-highway equipment and trucks and buses, about 70% of our diesel production is going into "vehicular" or "self-propelled" applications. So we have recognized the diesel as a vehicular engine. The only trouble is that emphasis has been on powering the larger, heavier types of equipment because we've had the engines for this application.

This is changing, partly due to the "internationalizing" process. In the past year, we've seen Ford and Chrysler join GM in bringing out diesel trucks. They started conservatively in the now-accepted GVW range. With Chrysler taking on Perkins engines, all have diesels for sale. All have small diesels and are known to be experimenting with them in lighter trucks (Detroit Diesel is actively selling their "53" engine in this service). All three are primarily in the vehicular business, (you can add International Harvester who is currently offering two light diesel-powered trucks at an attractive price) and have a foot on each continent. They've seen first hand what the smaller diesels can do in trucks—and they have them, both engines and chassis.

Problems have also gone international. High fuel costs that impelled the Europeans to accept the smaller diesels are a growing problem here. With today's fuel costs, including taxes, we're up to about half of fuel costs abroad, enough to worry about. Overall costs of transportation are climbing and there is a limit to "pass-on" or "absorbtion". User demand is for a cheaper way to operate. An example in the consumer field of this demand is the swing to "compacts".

Accent on Smaller Diesels

There's hardly an old-line builder of high-speed diesels that at some time in the past hasn't pushed diesel conversions for trucks. And some were for pretty low GVW's too. They were ahead of their time: then-current economics were against them. Discouraged, most of them followed the trend of development toward industrial engines and those for contractor-type equipment where weight could be tolerated and higher horsepower was ever in demand.

It is only since World War II that diesels began to catch hold in the high-GVW, long-haul trucks. Penetration is still far from complete but even this volume has boosted our total diesel production significantly and led to development of today's highly-refined "transportation" diesels. But when interest began to develop in diesels for taxicabs, door-to-door delivery trucks and in-city delivery trucks, most of our builders were caught with their horsepower up.

Today, most engine builders are looking closely at the low end of their horsepower line. Their degree of activity is in proportion to their conviction that the big mass market for diesels lies in lighter vehicular application. Some have engines right now that are suitable for application in vehicles down to 16,000 GVW; a few have engines for even smaller vehicles. And in this overall group, some have even smaller engines on the boards.

What's Holding Us Up?

Current repowering activity is proof of the practicality of developing this light vehicular field. Repowering is fairly expensive and yet it's paying off. Both Detroit Diesel and Cummins have active repowering programs in the light-load, short-haul field. These and other engine builders are also approaching the market through original equipment manufacturers.

Unfortunately, builders of the lighter trucks are not as convinced of the diesel's future role as are the diesel engine builders. Many of these truck builders have a stake in gasoline engine production that they hesitate to jeopardize. Then they cite such factors as high original diesel cost and the additional sales effort to convince users to spend more even if it means they can make more.

These are very real objections and must be overcome. When more customers demand diesels, and the increase in repowering indicates that this is coming, truck builders will have to re-evaluate their position. Costs are largely a matter of production and this must be increased in every possible way—one way being to produce a more attractive package through design for lower cost, through sharper pencils, more applications for the same basic engine. Get the costs down and a lot of sales resistance will vanish. Get the right product at the right prices and this whole field of application will snowball!

Our Industry in General

So far, talk has been principally about vehicular diesels because what happens in this area of application will have a profound effect on the future shape and size of our industry. Achievement of high diesel production with consequent reduction costs, plus availability of small high-speed diesels, would open up applicational possibilities currently denied. It would also have a broadening effect on current diesel usage in other-than-vehicular applications.

In the meantime, what's ahead for 1961? Consensus of the pundits is that we are facing a slow first half with things picking up during the second half. This is for business in general and is the expected pattern. How individual companies fare is largely a matter of their inventory situation, the fields that they serve and how imaginatively and aggressively they sell.

Let's look at the major fields of diesel usage.

RAILROADS—Mild optimism is the mood of the railroads. Current industrial inventories are being worked off and soon will have to be replaced, boosting car loadings. Activity should also pick up with spring. The expanding pattern of industry will help too. Some mergers, if consumated, will reduce operating cost of some railroads. Affecting the whole industry, there is hope for early Congressional legislative action easing onerous regulation. Also, railroads hope to attract more business through technological advancement and improved service.

With domestic railroads so completely dieselized, new locomotive sales are pretty well limited to supplying special, improved types and to replacement. About 37% of units on Class I railroads are 10 or more years old and are or soon will be candidates for remanufacture as in the case of EMD, trade-in on new units.

HIGHWAY TRANSPORTATION—Diesel bus sales will be limited to replacement and new requirements caused by urban expansion *as long as the present concept of diesel usage in this service persists.* They are now applied primarily in large bus sizes for inter- and intra-city service. There is no technical reasons against and good economic reasons for use of diesels in buses down to school-bus size.

Much has already been said about trucks. To this, we would add one idea—let's not overlook the private and contract carrier fleets as well as leasing outfits. Local trucking must increase. No matter what type of carrier handles the long haul—truck, train, plane, ship or barge—local trucks must handle the freight at both ends. These can be diesel.

MARINE—Some new trends in the marine industry give cause for moderate optimism. For one thing, diesel-powered vessels are being applied to specific jobs that did not exist some years back, for example, servicing offshore drilling rigs. Specific designs are being developed for many specific jobs. Efficiency of these special vessels is such as to stimulate new construction rather than attempt adaption of existing vessels.

In towboats, there's a trend toward more power per shaft. In some cases, engines have been compounded for this purpose. Extension of this idea could lead to the sale of more engines.

Containerization could have an effect on coastal shipping. Recently, two motor-vessels, the FLORIDIAN and the NEW YORKER, started service from New York City to Jacksonville, Fla., with extension to Miami in prospect. Success could stimulate coastal shipping.

MUNICIPAL AND UTILITY—In the municipal field, increasing electrical loads are creating some demand for additional engines or engines to replace older, less-efficient units. Use of engines in sewage plants is picking up somewhat as the result of population increases and tighter control of waste disposal practices. Also, diesels are finding a fairly steady market for pumping in water systems, where storm drainage problems exist, as well as in other municipal activities.

Utilities are running into a more urgent need for low-cost peaking plants. Years back, improvements in efficiency of new plants and the economics involved made it possible to relegate older plants to this service. Today, load requirements necessitate plant capacity increases at closer time intervals. Also, efficiency improvement from addition to addition is narrowing. Thus it has become economic to keep the older plants on base load production and this has created a need for some sort of lowcost peaking plants.

Availability of portable, completely-automatic diesel-electric generating plants in capacities up to 10,000 kw is intensifying utility interest. For example, Electro-Motive Division; GM, is optimistic concerning prospects for their "MU" plants ranging from the MU-20 with 2000 kw to their MU-100 with 10,000 kw, in 2000-kw steps. With a quoted FOB Factory price of $82 per kw, these should certainly meet the utilities' needs for low-cost peaking plants.

GENERAL INDUSTRY—Moderate growth is seen in this category that covers industrial power applications, including standby units, and those engines in services not covered in other categories listed. Engines in quar-

(*Continued on page 51*)

ACCESSORIES

broaden diesel versatility, flexibility, efficiency!

Are you getting all that's coming to you from your diesel? Today's accessories can help tailor your prime mover to the particular job you want it to do. Accessories are important, are vital to today's diesel industry!

Today's basic engine fits many different uses. It's a good thing, too, because it would be very expensive if a special engine had to be designed for each type of application. What then makes it possible to use the same basic engine in such widely divergent applications as electric generation and vehicular use? Versatility and applicational flexibility lies in how the engine is equipped, what accessories are used.

What job is the engine required to do? What is the type of service and what are the normal environmental conditions of this use? Once these questions are resolved, you can start fitting out the basic engine with the assurance that it will do the job. Engine builders provide some options—for example the oil pan might be different for a vehicular engine than for a portable power unit, manifolds different for a marine engine or the type of governor might vary with the intended service.

Going beyond certain basic engine options that necessarily fall in the province of the engine builders, applicational flexibility is provided by accessory equipment. Accessory manufacturers, often working with the engine builders, have expended much time and talent in producing items that make the basic engine suitable for nearly any application.

We're not talking about engine components—piston rings, valves, turbochargers, governors, etc.—but about the "bolt on" accessories that provide such versatility. For example, let's take the general applicational category of "Pumping". The same engine might be used in deep-well water pumping and in an oil well fracturing unit. In the first case a simple PTO and U-joint drive might be used. The engine might be set up for long-term unattended operation. In the second case, a torque converter drive might be indicated for the high-pressure pump and continual attendance is normal.

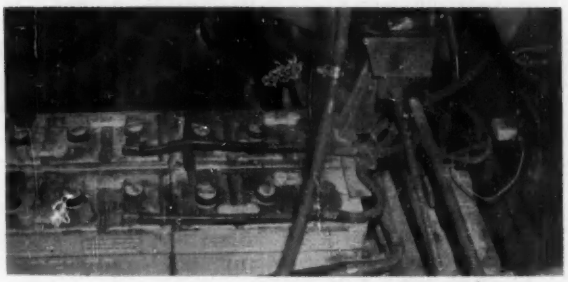
There's a difference in the job to be done by the same basic engine and its ability to do each job depends on the accessories applied. Important? You bet! And that's the reason why we point out some of the various, typical accessories as they apply to engine systems and functions.

What Starting Equipment . . .

Electrical starting systems are by far the most popular means for starting diesels. Yet there are applications and environmental conditions in which other systems offer decided advantages. So again we must determine: What are we trying to do and under what conditions. Fortunately, the engine builder—and the user—has a good choice.

Tremendous strides have been made in development of electrical starting systems. Perhaps most important is greatly improved reliability of all system components. Of course, if you kid yourself by not demanding—and paying for—the heavy-duty equipment required for diesels, you'll not get the advantages of this development.

Today's starting motors are built for high cranking torques needed by diesels and long service life under severe conditions. Batteries are being built to stand more physical as well as electrical abuse. They'll cycle deeper for many more cycles. Generators, both a-c and d-c, provide high capacity for battery charging and carrying other electrical loads. Cut-in speeds are lower. Silicon diode rectifiers make use of alternators very practical. Regulators, partially or wholly transistorized, are better than ever. Regulation is better, often charging voltage is externally selectable, and this reduces the cases of over and under-charging, so hard on batteries.



New systems are reducing electrical failures. Here, Delco-Remy equipment on Denver-Chicago truck includes long-life batteries located close to the heavy-duty high-torque starter (arrow).

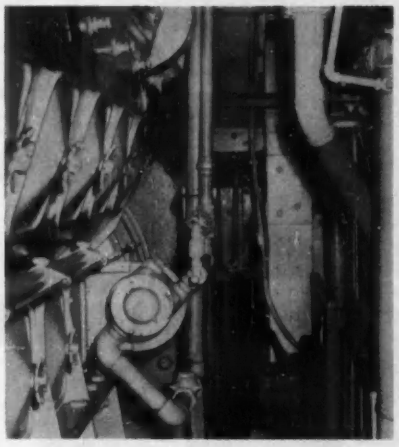
But suppose that in your operation an engine runs for days between shutdown. Here's where battery over charging can be a real problem. Your generator is running for long periods, wearing brushes, when it's not really needed. Wherever starting is infrequent or that a suitable compressed air supply is available to meet starting needs, air starters offer advantages.

Now suppose that you're operating in a remote area. Or perhaps in a very cold climate. You can't run around the block for fresh batteries and you don't have

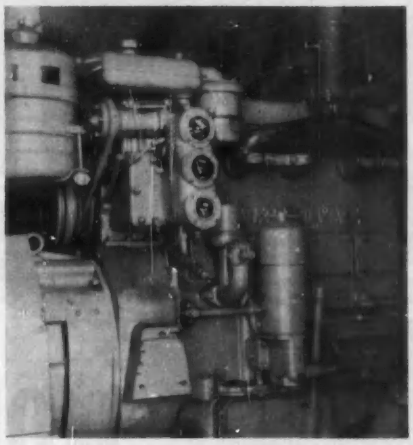
an air supply. To be completely self-sufficient, you'd like to be able to crank the engine by hand if needed. How about a hydraulic starter? They'll supply all the torque you need and accumulator pressure can be built up by hand pump in a pinch. Ordinarily, a small pump on the engine will build up accumulator pressure for subsequent starts once the engine is running.

Another way to "bootstrap" into operation is with a gasoline starting engine. As a commentary on improvement in other starting systems, these are not as popular as they were. But they are still used and many people swear by them. The small engine can be started by hand and first supplies some heat to the main engine. Then it provides cranking torque.

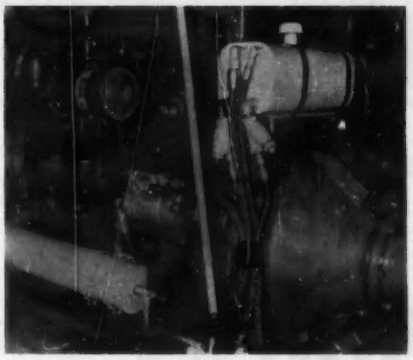
We've painted with a broad brush; many fine points are missing. In fact, we've picked extremes to illustrate the wide variety of conditions under which our basic engine is asked to operate. The point is that suitable starting accessories are available to meet practically any need.



Where you have air source and need only occasional starts, air starting is good choice. Ingersoll-Rand unit shown here on EMD locomotive — I-R builds 'em in all capacities, small to big engines.



Starting engine (Caterpillar in this case) gives unlimited cranking period, warms up big engine before starting it.



American Bosch's Hydrotor is good example of hydraulic cranking systems. Accumulator, left, Hydrotor, center, reservoir, right. Handpump allows bootstrap operation. Engine driven pump takes over after initial start.

Engines Must Have Clean Air . . .

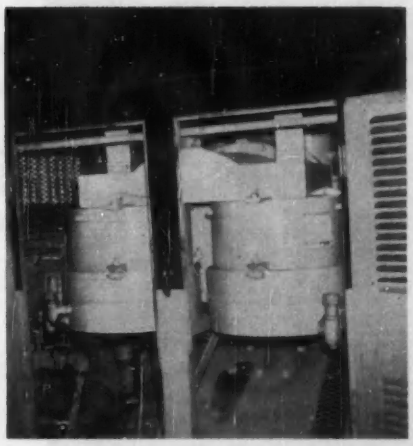
Development of efficient air cleaners has made long engine life possible under just about any airborne dirt conditions. The perfect air cleaner has been defined as one that removes all dirt, requires no servicing, takes up practically no space and costs next to nothing. Manufacturers are coming closer to this ideal. However, it's interesting that this definition covers four of the major variables applying to air cleaning equipment—efficiency, servicing needs, space requirements and cost.

In a given installation, one or more of these might be the governing factor, always bearing in mind that in any compromise, the engine must be protected to the highest possible degree. Fortunately, there are enough air cleaner types and high-quality makes in each type to meet practically any set of circumstances.

Obviously, a tractor operating in its self-made dust storm has a different air cleaning problem than does a generator set operating in a relatively dust-free area. Less obviously, there's a difference in dirt load between a city and its suburbs. A New York bus company found this out when the wear rates on city bus engines showed much higher than for bus engines operating less than ten miles away. So there is a need for tailoring air cleaning systems—and the products are available.

Air cleaners break down into three basic types—panel, oil-bath and dry-type units. Panel filters, coated

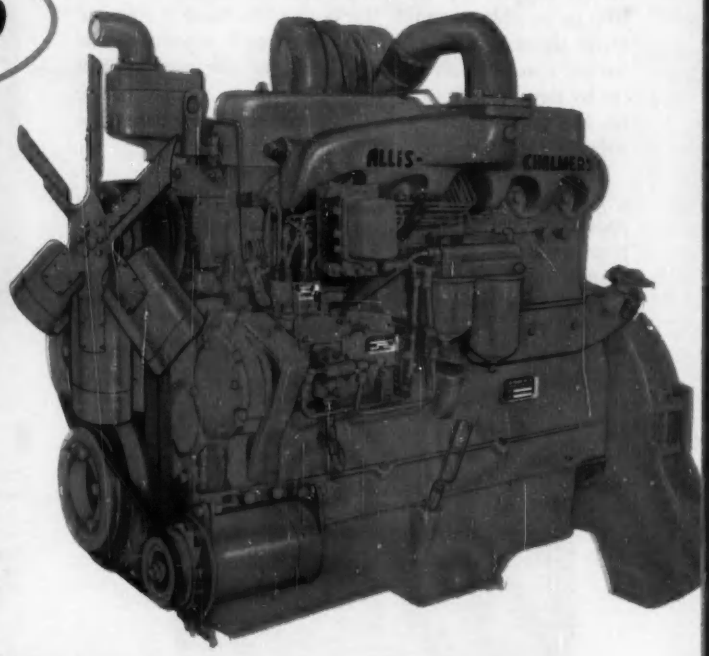
(Continued on page 28)



Twin Air Maze oil bath air cleaners on locomotive engine. After air cleaning in car body air panels, engine air is again cleaned before entering engine.

11000

210 hp at 2200 rpm
(Turbocharged)



NOW

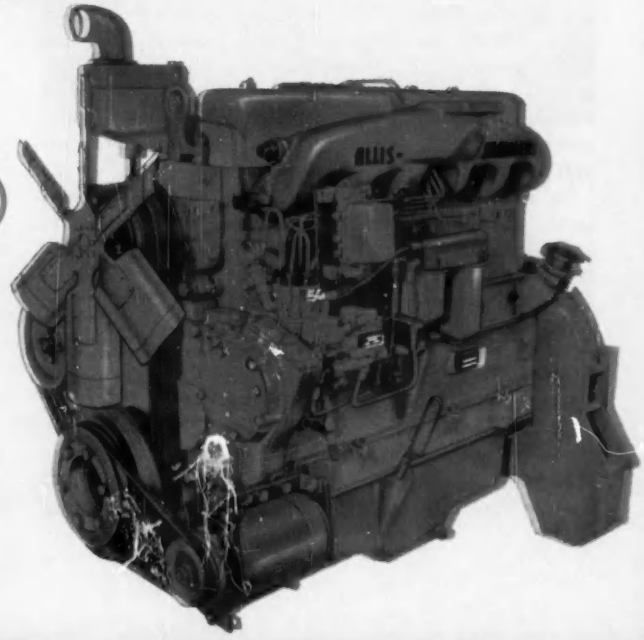
A NEW KIND OF DIESEL

WORK POWER

in the 145-210 hp range

10000

145 hp at 2200 rpm



Nowhere is there anything like these two great new Allis-Chalmers diesels—nothing compares with them in their range!

Real Work Power — The 210 hp in the turbocharged 11000 and 145 hp in the 10000 is down-to-earth power you can use — *work* power to operate smoothly under extreme load conditions.

High, Sustained Torque gives you work power throughout the entire operating speed range — power that really hangs on.

Great Fuel Economy — These new diesels have a unique combustion system that thoroughly mixes fuel and air for complete combustion. These engines run so efficiently that they work *extra hours every day* on the same amount of fuel used by other diesels in their range.

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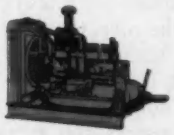

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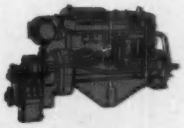

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(Continued from page 25)

with viscous materials to catch and hold dirt, are used, for example, as car body filters on locomotives and in some stationary engine installations. However, there is a growing feeling that these are not efficient enough for use as final filters for engine air. Also, they pose quite a service problem.

A notable exception is American Air Filter's Roll-O-Matic, consisting of a precoated glass fiber blanket that is periodically advanced to expose new area. This maintains efficiency and also holds a fairly constant pressure drop across the filtering media.

Actually, oil-bath cleaners are an extension of the panel filter's principle of viscous impingement. While some dirt is removed from the air as it passes through and entrains the oil (some dirt is also thrown out as air reverses direction in the oil), the screens that are continually wetted and washed by the air-entrained oil catch most of the dirt, particularly the fine particles.

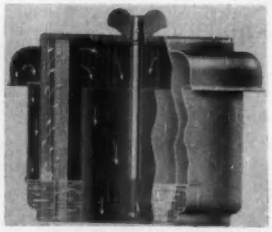
Dry-type filters are coming more and more into the picture. Impregnated papers and fabrics do the filtering. Control of pore size determines their efficiency which actually increased during service as dirt buildups block the pores. Two things are done to increase the period of service before cleaning or replacement is required. First, a lot of filtering area is packed in a small space by pleating the elements. Second, several types of precleaners are used in conjunction with the main filter to lessen the dirt load on it.

This brings up the subject of 2-stage filtration. This is becoming more popular as realization of the economic importance of good air filtration grows in the field. Combinations of oil-bath and dry-type cleaners are providing long service life combined with exceptionally high efficiency in many tough airborne dirt situations. Dry-type elements in series are also used to provide high efficiency and as a safeguard against the effects of possible damage to one element.

Precleaners are being widely used with dry-type elements. Centrifugal and cyclonic types remove a high percentage of the airborne dirt before it gets to the final element. Efficiency of the combination is high and service life of final element is greatly extended. Another type of precleaner consists of an inexpensive "blanket" surrounding the final element. When loaded, this blanket is thrown away and replaced in a matter of seconds.

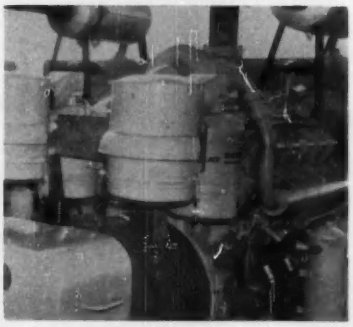
Farr's Roto-Pamic air filter has bank of cyclone precleaning tubes, final dry-type element. Pipe goes to exhaust where aspirator pulls out dirt.

Fram dry-type air cleaner, here mounted on a fuel delivery truck, features an inexpensive, easily-replaced "blanket" of filtering material wrapped around the main paper element.

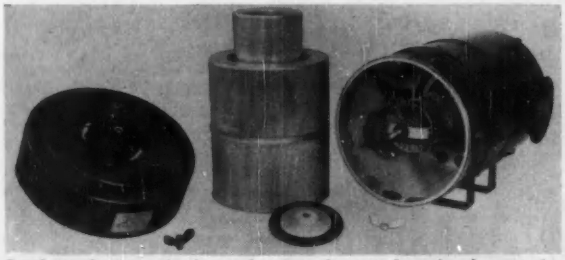


Air Maze oil-bath filter shows air flow through oil, filter and separator to engine intake.

American Air Filter's large oil-bath cleaner operates differently. Oil from sump is lifted pneumatically to perforated entrainment plate. Air passing through holes carries oil to conical filter element where dirt is trapped. Filter is wetted and washed. Final separator is above.



Two Donaldson filters in series protect these mobile drill rig engines. In Donaclone unit, air passes through cyclonic tubes in base that remove major dirt load centrifugally. Dry-type paper element completes job.



Purolator dry-type air cleaner has two elements in series. Large outer element has high dirt-holding capacity, minimizes dirt to inner unit.

Incidently, precleaners depending on centrifugal force for dirt removal are not recommended with oil-bath cleaners. The violent action breaks down large dirt agglomerations into its component fine material. Oil-bath filters have trouble catching these fines and as a result, overall cleaning efficiency may be actually reduced. Fortunately, the oil-bath filter's dirt holding capacity is high enough to give good service life without precleaning.

All these developments in air cleaning have had several effects. First, today's high cleaning efficiency has been an important factor in extending engine life to today's standards. Not only is downtime decreased but ways have been found to decrease actual servicing time on the cleaners. The different types and arrangements available make it possible to get good air cleaning even under stringent space conditions. In the matter of costs, decreased engine downtime through better engine protection and less frequent servicing of the cleaners themselves add up to savings that prove the economy of good air cleaning.

And as for our basic engine, it can now operate under airborne dirt conditions that in the past would put it in an early grave.

Fuel and Lube Filtration Is Important Too . . .

Take fuels, now. One engine gets its fuel from a storage tank filled directly from the supplier's truck. Another, working way out on a construction job, gets its fuels from drums. These drums may sit out in a dusty area and are exposed to daily temperature changes. Transfering fuel from them to the equipment's tank may not be the cleanest process in the world. Result—dirt and water from condensation in the fuel.

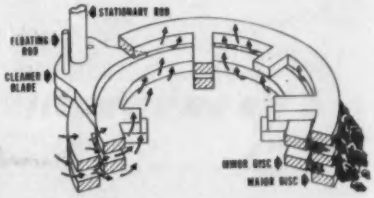
So there can be a wide difference in the cleanliness of fuel that our same basic engine must use. Proper fuel filtration removes the difference. It's impossible to over-stress the importance of clean fuel. Injection equipment is an expensive part of the diesel and is worth protecting for its own sake. At least as important (if not more so) are the results to the rest of the engine when fuel injection equipment becomes prematurely worn or damaged.

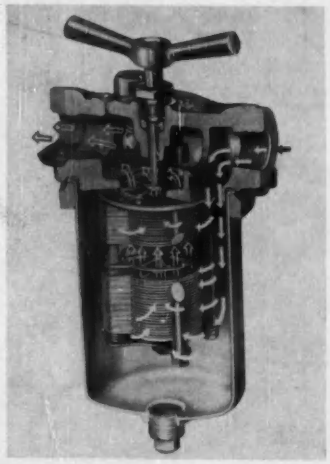
Amount of investment needed to insure clean fuel under any given set of conditions will never in this world exceed the savings that result. So you can't help but win. Keep this in mind and don't scrimp; it's false economy. You'll have to face up to the questions of—how many? . . . what type? . . . and what size? Here are some thoughts on the subject.

A strainer or metal edge-type filter is the first line of defense. Some are effective as water separators, some are cleanable by the turn of a handle but all will hold the larger dirt particles, tank scale and other contaminants. This relieves the dirt load on the next filter and lengthens its life, a definite economy factor.

Preferably, a secondary filter of good capacity should be used. Taking out particles of, say, down to 10-micron size or smaller, it relieves the load on the final filter that does the final polishing. This final filter is the last line of defense and should take out particles to at least, say, 3-micron size.

Fuel filters, or any accessories for that matter, are poor items to buy on "price" or "convenience". *They're too important.* Sticking to top makes, backed by sound research and quality control, you still have a wide variety to suit both the requirements for cleaning different fuels and meeting the particular dirt conditions in different services.





Cuno's Auto-Klean depends on disc spacing for degree of filtration. Cleaner-blades between discs take out dirt as element is rotated by outside handle.

In Cuno's Super Auto-Klean space between major disc ID and minor disc OD is controlled in manufacture for required filtration. Handle rotates element and cleaner blade scrape out trapped contaminants.

Now, about lube filters. Here we have both external dirt and contaminants produced within the engine to control. External dirt can be introduced during filling or adding make-up oil but worst offenders are unprotected or inadequately protected breathers or crankcase ventilation systems. Don't overlook these sources of lube oil contamination.

Engine-produced contaminants include fuel dilution, sludges and acidic materials resulting from blow-

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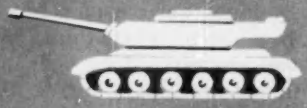

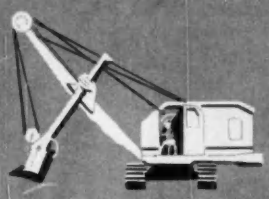

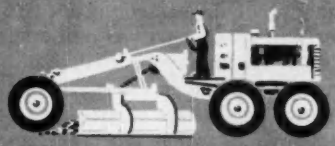

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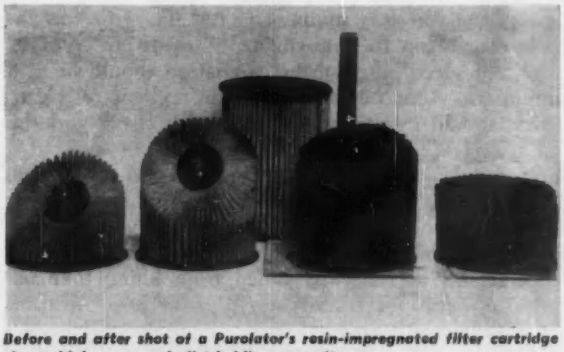
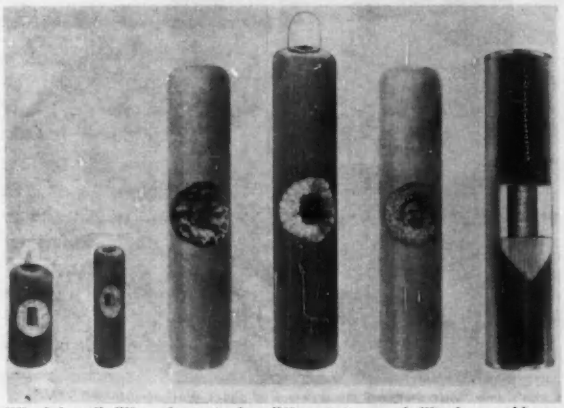
by of combustion by-products, oil oxidation products and wear metal. Fuel dilution is something that filters can't do much about but all the others, leading to deposits, wear and abrasion, can be controlled.

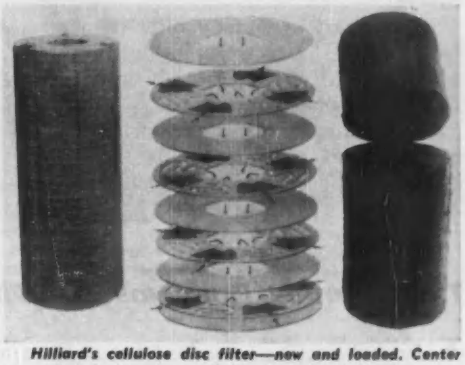
Filtering arrangements—full-flow, bypass, shunt, or a combination—can be applied to suit requirements of any service to which our basic engine is put. Also, there is a wide choice of filtering media, flow rates and fineness of filtration to suit the system selected. Let's see how this might work in two entirely different services.



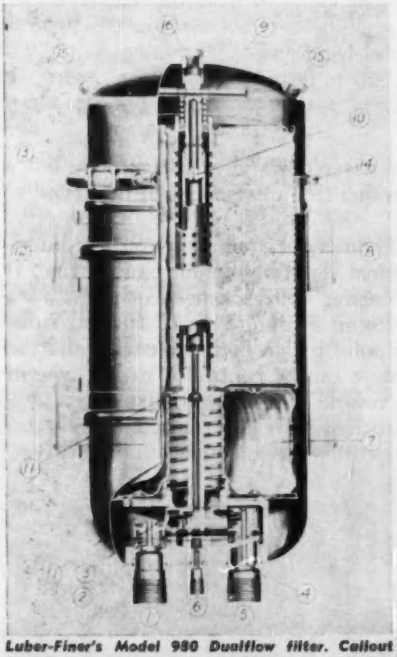
Before and after shot of a Purolator's resin-impregnated filter cartridge shows high area and dirt-holding capacity.



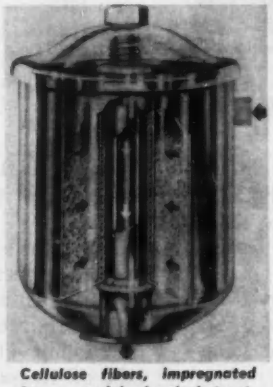
Wix lube oil filter elements for different types of filtering problems. Cutaways show different fills, densities available.



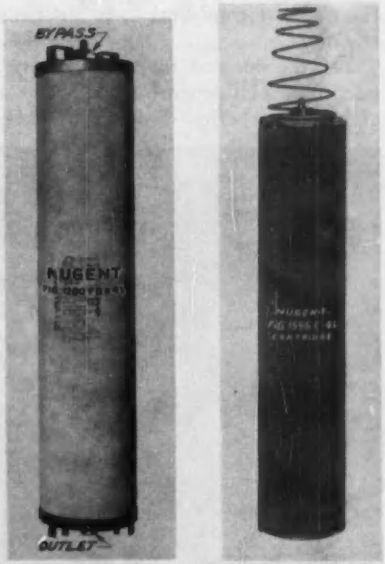
Hilliard's cellulose disc filter—new and loaded. Center exploded view shows oil flow and large filtering area. Just one of many types built by Hilliard.



Luber-Finer's Model 980 Dualflow filter. Callout No. 7 shows a cutaway of 45-micron full-flow element fabric bag. Just above, No. 8, is their Dieselpak by-pass element.



Cellulose fibers, impregnated by a special chemical treatment, increase adsorbtion in Fram's "Cel-Pak" element.



Two of several element types built by Nugent. Left is cotton-type with built-in by-pass. Right, their paper disc unit.

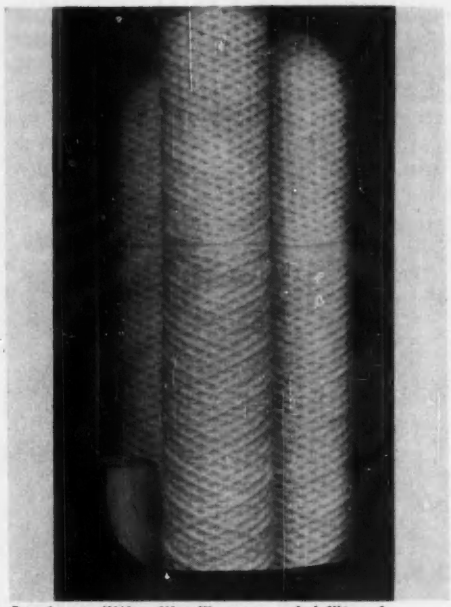
One engine application is for electrical generation. The engine is conservatively rated for continuous service. Environmental conditions are good, load percentage is fairly high and maintenance conditions are good. First, the engine will probably have the largest oil capacity of the various options. There is room for both a full-flow and a bypass system to polish the oil.

External dirt is a minimal factor and with the engine usually up to temperature at relatively constant load and speed, internal dirt formation should be at a minimum. Reduced dirt load and excellent oil cleanliness should extend life of the engine, filter and the oil.

Now take the same engine in front-end loader use. There'll be a high percentage of external dirt to be kept out of the engine. The work cycle is very irregular as to both speed and load. Cylinder temperatures vary considerably as service is varied from idling to maximum power. This type of service promotes formation of internal contaminants.

Yet through careful selection of even a single full-flow filter the engine will turn in very creditable performance. Oil life and filter life will not be that of our generator set but remember, the purpose of filtration is not to save the oil or the filter elements, *it's to save the engine.*

If you want to save on filter element cost, get big enough filters. A filter with a flow rate that's marginal for your need will do the job only so long. The elements will soon plug and you'll be riding the bypass, letting unfiltered oil into the engine. Double the filtering area and you'll not only double but triple or quadruple the life of the elements before a change is needed.



Cuno's new "Micro-Wynd" square-ended filter element butts without separators . . . features cotton-cellulose wound in special "blanket".

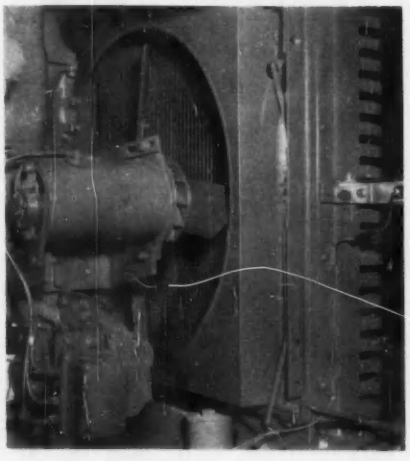
Then Cooling Problems Are Different . . .

Today we're taking more heat out of the same "iron" than we did even ten years ago. Why? Simply because we're taking a lot more horsepower out of the same "iron" and while specific fuel consumptions are better, the gallons of fuel per hour going through the nozzles is higher. Roughly 30% of the fuel's heat energy is rejected to the water. A lot goes to the lube oil too. So there's more total heat to be dissipated from the same engine.

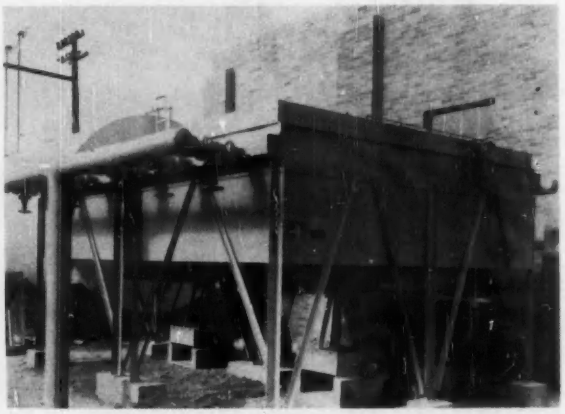
Yet the amount of water and system size has not been increased proportionately. The answer lies in several things—better design of jackets, increased flow velocities, higher water operating temperatures—but a large part of it is due to improvement in heat transfer devices.

Again, the wide variety of equipment available broadens the applicational versatility of our basic engine. It can be a marine engine, heat exchanger-cooled with sea water, or power for an earthmover with fan and radiator cooling. The point is that both the engine and the lube oil temperature can be controlled in any type of service and with compact, effective components.

Much has been done to improve shrouding and fan design. Again, improvements in cooling efficiency. New



Young water-to-air coolers, a simple radiator and big horizontal unit. Both use fans for air circulation. Unit on right may employ multiple-speed fans plus shutter control for close temperature control.



fans have reduced parasitic loads on the engine . . . and they run quieter. Controlled fans of different designs have been very effective in this respect. By automatic control of either fan speed or blade pitch, they limit power takeout to only that required at the particular time for temperature control. Fuel savings or the additional useful power can be very significant.

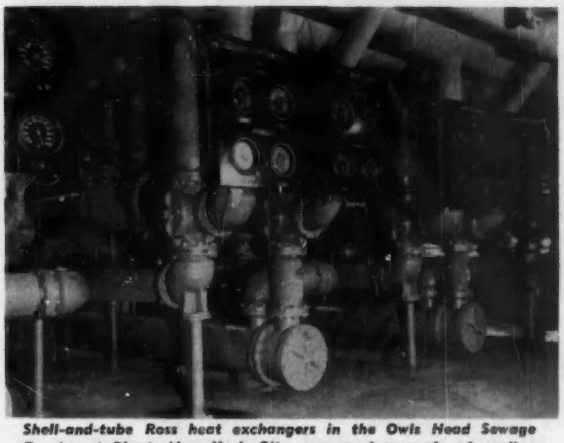
Heat exchangers are also improved—better materials for longer life, improved heat transfer in less space. Both shell-and-tube and plate-type exchangers are available in just about any size. A great many of the plate-type units because of their high heat transfer-to-size ratio are used as oil coolers right in the radiator-cooled jacket water system.

The full gamut of automatic temperature controls available further extends the applicational flexibility of engines. Thermostats control water flow to get fast engine warmup and then maintain proper temperatures. Thermostatically-operated shutters modulate air flow through the radiator. Working with thermostats they broaden the range of conditions in which control is precise, being particularly useful in avoiding over cooling.

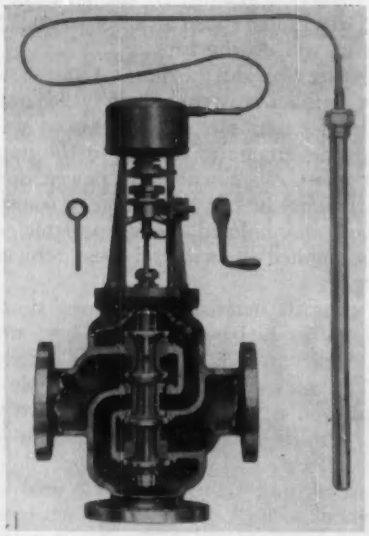
In heat exchanger-cooled installations, thermostatic flow control valves are particularly useful. In all cases they should be installed so as not to reduce total flow through the engine. Remote-sensing and control elements enable the valve to be placed in the secondary or raw water circuit, under control of the sensing element in the primary water circuit, say, at the water outlet from the engine.

Today's radiators are more efficient from the heat transfer viewpoint, hence they handle higher heat loads. They're made rugged to stand up to today's operating conditions. A lot of attention has been given to the subject of aeration and how to avoid it. De-aeration features built in or in separate surge tanks reduce system oxidation corrosion as well as increasing cooling capacity.

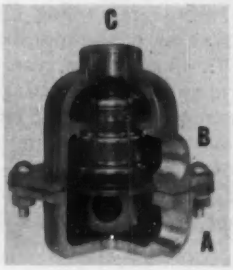
Schwitzer modulated-speed fan is sensitive to air temperature through radiator. Other models are sensitive to water temperature. Modulating fan speed to cooling requirements cuts horsepower loss and fuel consumption.



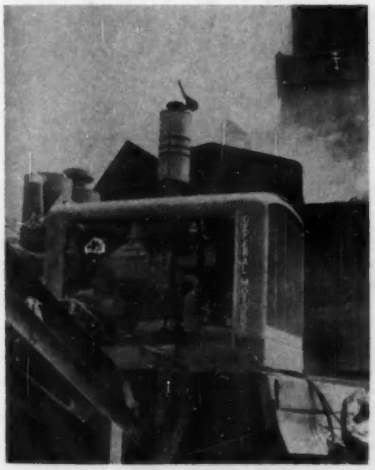
Shell-and-tube Ross heat exchangers in the Owls Head Sewage Treatment Plant, New York City, are good example of cooling system flexibility. Jacket water gives up heat to plant effluent for use in digesters as needed.



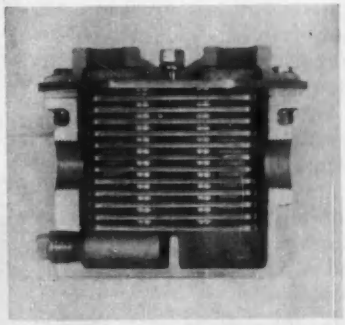
▲ *Fulton-Syphon remote-sensing flow control valve controls outflow temperature by blending. Has manual setting.*



◀ *Amot flow control has internal temperature sensing at "C" opening. Valve position controls flows through "A" and "B" as needed.*



Detroit Diesel engine on crusher work has plate-type oil cooler in housing at lower right of blower. Water from radiator passes through cooler into engine.



Cutaway of a Harrison plate-type cooler similar to that on engine at left. Plate construction gives a lot of cooling area in small space. Here, oil flows through plates in thin films, water contacts outside plate surfaces.

Using Engine Power Effectively . . .

If there were no power transmission devices, engines could only be applied where the load's speed-torque characteristics never exceeded those of the engine's horsepower curve. You'd have no disconnect clutch and the engine would even have to start against a torque load. This is why today we have a wide variety of power transmission devices, capable of altering engine power characteristics to meet practically any type of load requirement.

Some power loss if only from friction is inherent in all power transmission devices. Yet it has been proven time and time again that, properly selected and applied, use of these devices provide more useable horsepower at the output shaft where it counts. This is because the engine is permitted to get to and operate in its optimum power range.

Power take-offs are a simple example of this. We're talking of units to transmit full engine shaft power. A clutch is always incorporated. It can have a single or multiple discs, be manually, hydraulically or air operated and in the last two cases, operated locally or remotely. Disconnection of engine and load permits the engine to be started without any external torque load. Engine rpm can be increased to where it is developing enough power to start the load before the clutch is engaged. The clutch friction surfaces take up the slip until the load is accelerated to engine shaft speed.

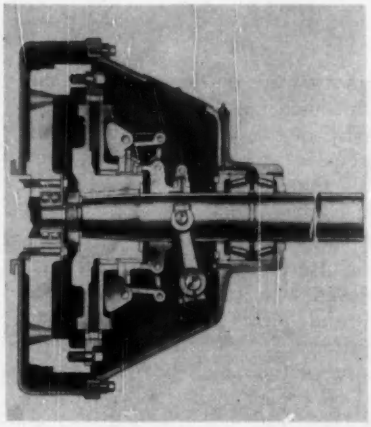
Want to change output shaft speed or multiply its torque? You can sacrifice shaft speed for more torque with reduction gearing, in the PTO or as a separate units. Need more speed at lower torque? Speed-increasing gears will do the trick.

Carrying this idea further, a transmission gives a selective number of output shaft speeds and torques. On vehicles, for example, a closely-spaced set of gear steps permits the engine to operate in the upper half of its speed-power range where its power is adequate and fuel efficiency best. A wide range of transmissions, both standard and tailored, being available, engine power can be applied in practically any vehicle type in any service.

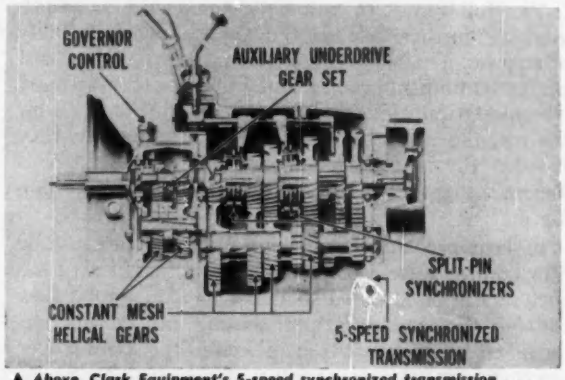
In general, manual-shift transmissions are favored for most on-highway trucks. Their importance for proper utilization of engine power is reflected in their high degree of refinement. They provide as high as 10, 12 and even 15 speed ratios, many have pressure lubrication with its own filtering system, and devices to improve shifting.

Some of these transmissions are used in off-highway equipment as well. However, service requirements are different and operating extremes not so broad as on the highways. For these reasons, power-shift transmissions with three or four ratios are finding favor. Shifting from one ratio to another is accomplished by clutch actuation to select the appropriate gear train. Multi-disc wet clutches, hydraulically operated, are frequently used. Shifting is accomplished without interruption of power-flow, very important when pulling a heavy load up a steep grade for example.

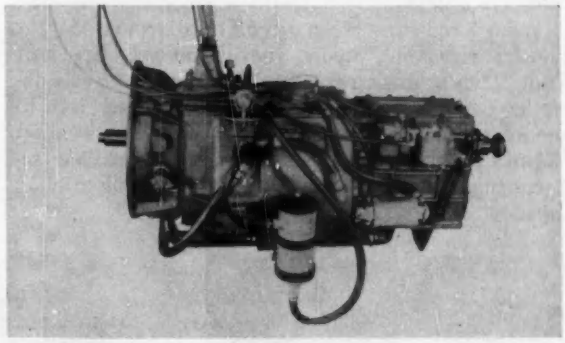
Where the shift points do not provide a broad enough torque-output speed range, these transmissions



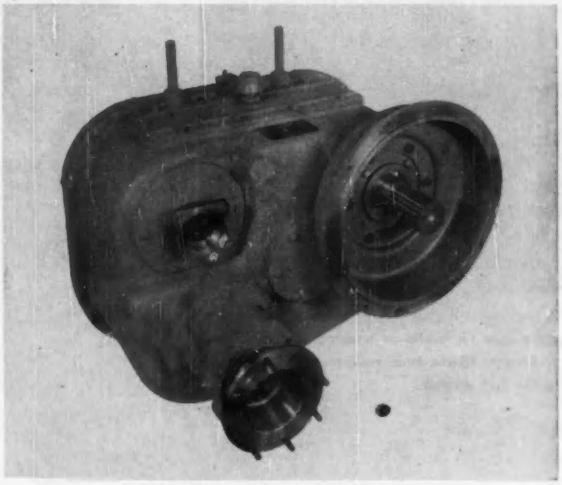
Rockford's PTO is typical of device used to engage and disengage full engine torque. Heavy bearings can accept high radial loading.



Above, Clark Equipment's 5-speed synchronized transmission . . . below, Fuller's 9-speed (not syncromesh) RoadRanger R-1750 with shifting aids, inertia brake and own filtration system.

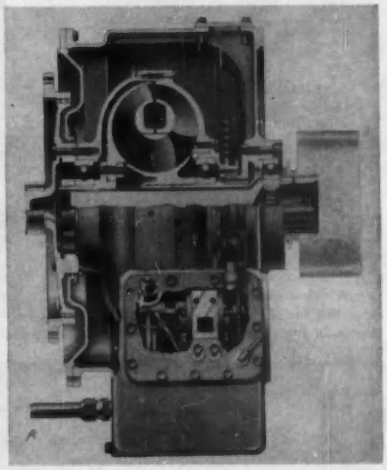


Cotta's FD-1078 special heavy duty transmission shows how custom units can be tailored for various shifts, takeouts and speeds.

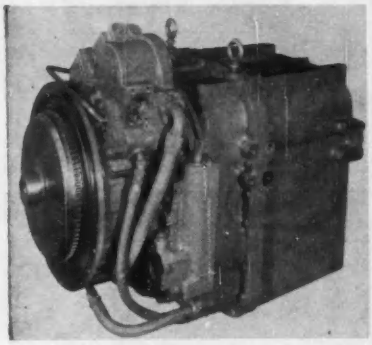


may be combined with a hydraulic torque converter. Conversely, the torque converter might be the base unit and enough gear ratios added to meet the spread of operating conditions. Converters are built in both vehicular and industrial types. Vehicular types frequently incorporate a free-wheeling stator, permitting high-efficiency operation as a fluid coupling when pump and turbine speeds are close. Some units also provide lock-up for direct drive when torque multiplication is not required.

Industrial converters, available in a wide range of capacities and multiplication ratios, make an ideal drive in many services. Full engine power can be applied, independent of output shaft speed. Use in shovels, cranes and oil well drill rigs is typical. Where the service requires a constant output shaft speed, only the torque load varying, a tailshaft governor can be fitted. This governor, working with the engine governor, controls engine speed and power settings to produce the required torque load at constant tailshaft speed.

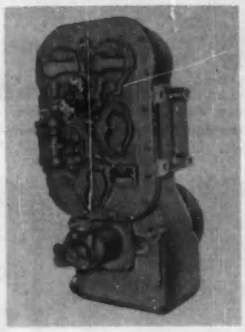


Clark Equipment's industrial-type converter has many options to increase its flexibility. As example, phantomed unit on output shaft is multi-disc clutch.



New Twin Disc vehicular torque converter with retarder coupled to 5-speed, plus reverse, power-shift gear box.

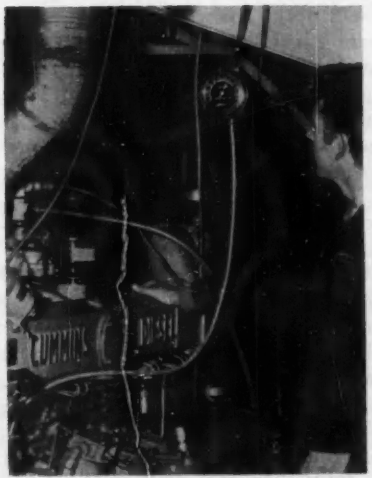
Clark Equipment has new 4-speed forward and reverse power-shift transmission.



Instrumentation and Control Systems Broaden Applications . . .

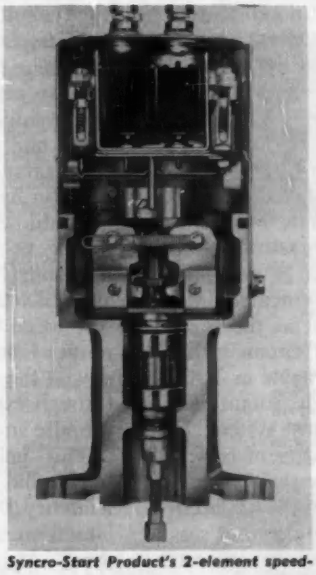
Our basic engine would probably have a stop-start control, a throttle, an oil pressure gauge and a water temperature gauge. If it had an electrical starting system, there'd be a charge-discharge ammeter. If this was it, applications would sure be limited. Fortunately, an array of instruments and controls are available to (1) broaden the scope of application and (2) protect the engine.

For example, we could use the engine in a speed-critical application by addition of a good tachometer. You could set it up to start automatically, using one of the many control systems available. Triggering action could be push-button, pressure, temperature or whatever. If you wanted to insure startability by periodic starting of the engine, add this to the control system. It can be made automatic to the point that, say, once a week the starting sequence would be energized and the engine cranked for 30 seconds. If no start, after a

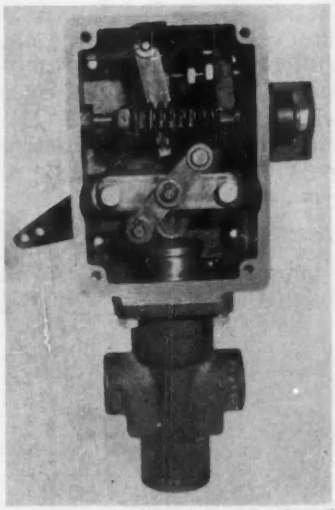


Diesel on Wildcat Mountain, N. H. ski tow has Barbour-Stockwell's Controller. One drive gives speed indication, records operating hours, gives overspeed protection.

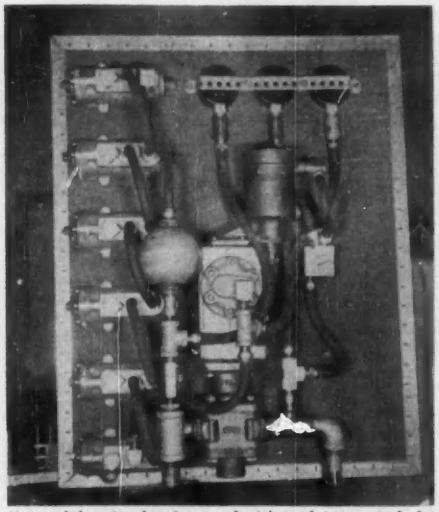
Wildcat Mountain Photo



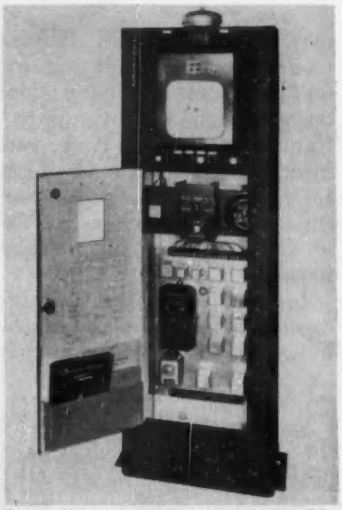
Syncro-Start Product's 2-element speed-sensitive switch monitors both over and under-speed. Various models are built. Minneapolis-Honeywell safety control (above) monitors high water temperature (left), low lube oil pressure (right). Preset limits actuate alarm or shutdown.



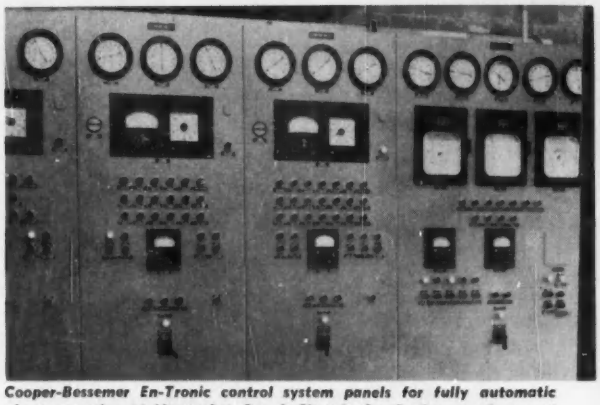
Amot's non-electric control uses engine oil pressure for shutdown on high water temp., low lube pressure.



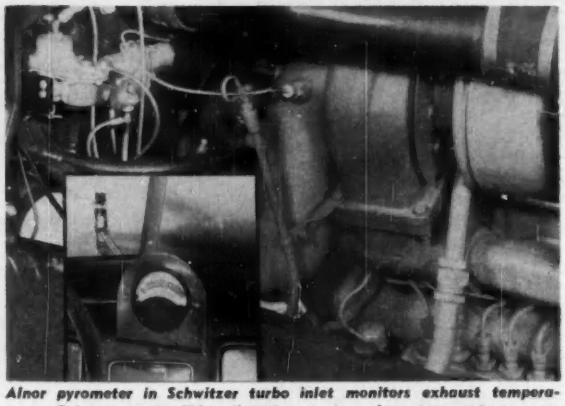
More elaborate Amot non-electric safety control for hazardous atmospheres, non-electric installations. Units (left) monitor six points, pinpoint failure.



Syncro-Start controller starts stand-by when triggered. It periodically initiates and tests engine starting.



Cooper-Bessemer En-Tronic control system panels for fully automatic plant operation at Nantucket Gas & Electric Co. Engine panels are at left, station control panel at right.



Alnor pyrometer in Schwitzer turbo inlet monitors exhaust temperatures. Driver sees condition (inset), acts to reduce temperatures, protects both turbo and engine (Mack).

short delay, cranking would start again. After three attempts the system is shut down and an alarm given.

This is only one of many possible variations using today's controls and instrumentation. Most systems start with simple sensing elements, usually standard items. With these as a base, the system can be as simple or complex as needed to meet the particular requirements.

Either alone or as part of these control systems, engine protection devices should be installed. Things often happen fast and even with someone in attendance, engines have been lost before corrective action could be taken. As an example of what can be done, the basic oil pressure gauge might be supplemented by a pressure-sensitive switch so arranged that at the minimum pressure desired it would close a circuit either sounding an alarm, shutting down the engine or both.

Critical temperatures can be similarly monitored. These can be in the water, lube or exhaust system. In the two latter cases it is primarily a matter of engine overload. A recently-introduced instrument is a pyrometer installed in the exhaust manifold of vehicular engines just ahead of the turbocharger. The operator sees when exhaust temperatures are critically high, indicating overload through lugging or an altitude condition. He can then cut back on fuel to prevent damage to the engine and specifically the turbocharger.

Overspeed protection is very desirable. Governors can fail or be damaged. Simple speed-sensitive devices are used to perform duties in line with the requirements. For example, a warning might be given at slight overspeed and shutdown occur when speed reaches a preset maximum. Some types warn of underspeed which can also be critical in some applications.

Shutdown protection is even afforded to engines having no electrical system. Combinations of hydro-mechanical and pneumatic-mechanical systems are available. One ingenious system uses engine oil pressure to do the whole job. A drop in this pressure as a result of lack of oil, a broken line or a bad pump shuts down the engine. Also, high water temperature, through expansion of a wax power pellet, shuts off oil pressure and also shuts down the engine.

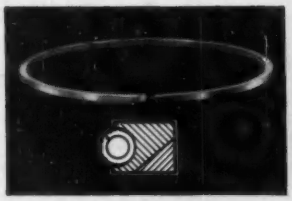
This field of instrumentation and controls is so broad and varied that only the surface has been scratched here. However, it can be seen that the only limitation on potential engine applications is imagination.

Caterpillar selects Koppers piston and sealing rings for use in the world's largest single engine crawler tractor.

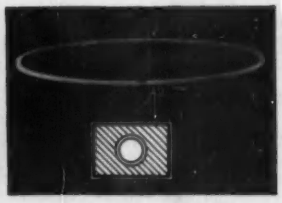
A brute of a tractor for brute force jobs, Caterpillar's D9 Series E Tractor applies a 335 HP engine which combines the versatility and economy of diesel power with the power boosting efficiency of a turbocharger. Traditional Caterpillar durability is built into every part. And in the power shift transmission sealing rings, chrome plated malleable iron compression rings, crankshaft seals, and steering control seals, that durability spells K-O-P-P-E-R-S.

Says Caterpillar: "The D9 Tractor is ruggedly built for long life under the most severe operating conditions. In addition, special attention has been given to insure the production of a power plant that is easy and economical to operate and maintain. On all these counts, the Koppers rings and seals we have selected meet our requirements of quality and dependability."

Write today for 8 page brochure on metallic sealing rings to: KOPPERS COMPANY, INC., Piston and Sealing Ring Department, 6401 Hamburg Street, Baltimore 3, Maryland.



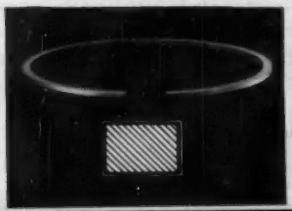
CRANKSHAFT SEALS: Application of a conformable step seal ring (specially designed for Caterpillar) establishes a *permanent* crankshaft seal, reliable for the life of the engine.

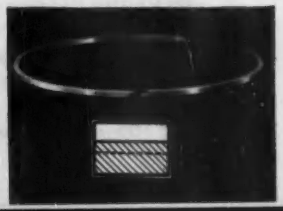


TRANSMISSION SEALING RINGS: Specially designed metallic sealing rings transmit fluid power to the rotor and actuate the clutches of Caterpillar's dramatic new power shift transmission.

COMPRESSION RINGS: Dependable performance at the most critical point in the combustion chamber is assured by chrome plated malleable iron rings.

STEERING CONTROL SEALS: Caterpillar's new design steering control requires a rotating, high pressure seal. Piston ring type seals establish simplicity, reliability.





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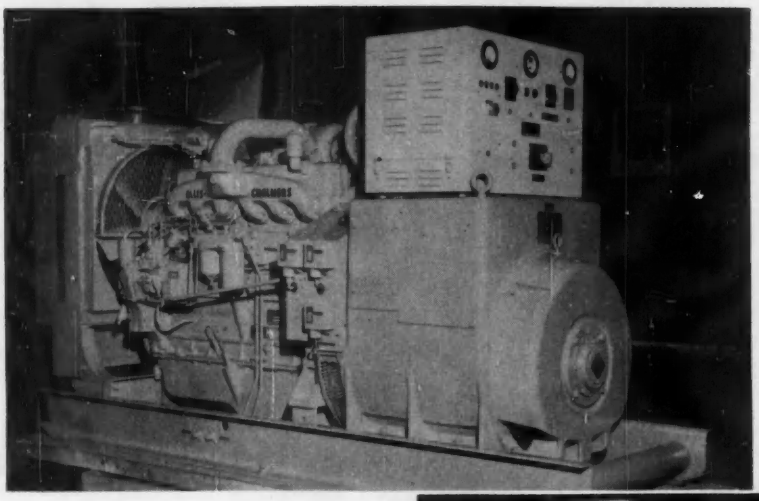
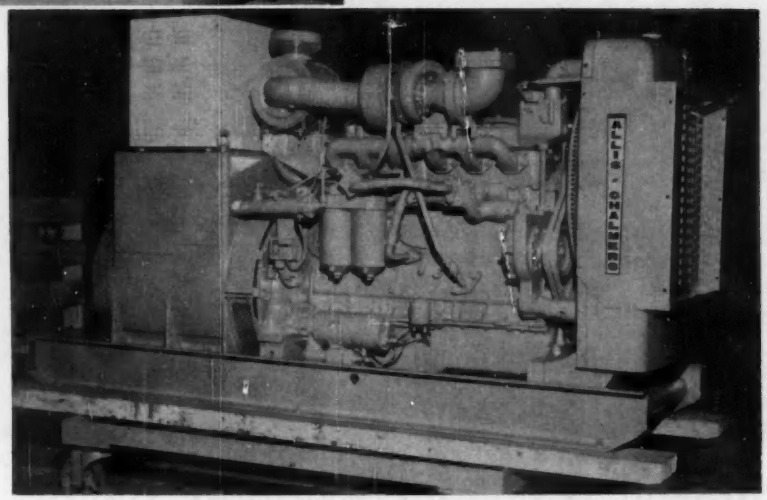


One of first Model 11000 engines was ordered for incorporation in this specialized generator set. Generator is also A-C's. Minneapolis-Honeywell controls provide engine protection. Open-type sets and closed models can be furnished with Twin Disc PTO's or torque-converter drive.



Opposite side shows Schwitzer turbo. Air cleaner is dry-type Fram (oil-bath Donaldson is used on some model 10000 power units); 2-stage lube filtration is by Fram units. Electrical equipment is Delco-Remy and radiator by Perfex.

Introducing Two New A-C Diesels

Two smaller diesels—the 10000 and 11000 models have been added to the family Allis-Chalmers started two years ago with their 16000 and 21000 engines.

Allis-Chalmers looked at the record of their 16000 and 21000 engines and liked what they saw . . . liked it so much that the basic design, particularly the combustion system, is to be the pattern for development of an engine "family". First offsprings are the brand new 10000 and 11000 models.

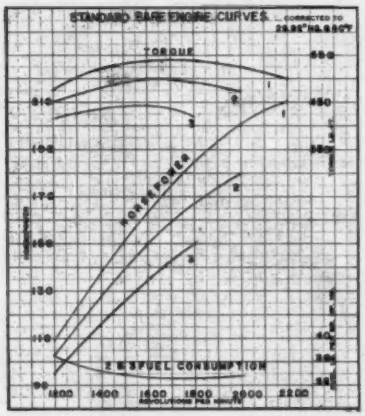
Both these new engines have the same displacement, 516 cubic inches. The 10000 engine is naturally-aspirated, the 11000 model, turbocharged. Between them they cover the power range from 105 to 210 horsepower, specific ratings depending on service and application.

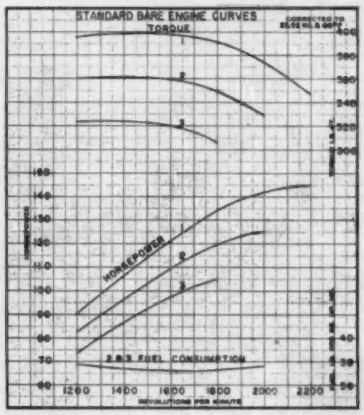
Right here, one point should be made clear. Note the comments below the performance curves. Allis-Chalmers does not quote maximum power. The top rating shown is that obtainable with production engines within the stated limits; in short, available, useable horsepower. This should be kept in mind in any comparison of engines.

Vital statistics of these engines are given in tabular form. Concentration here will be on important features, for example . . .

A Review of A-C's Combustion System

These engines like the earlier models have exceptionally flat and low fuel consumption curves. The 11000 engine uses as little as 0.366 lb/bhp/hr at rated power between 1600 and 1800 rpm. Credit for this low figure





Bare Engine Power Ratings

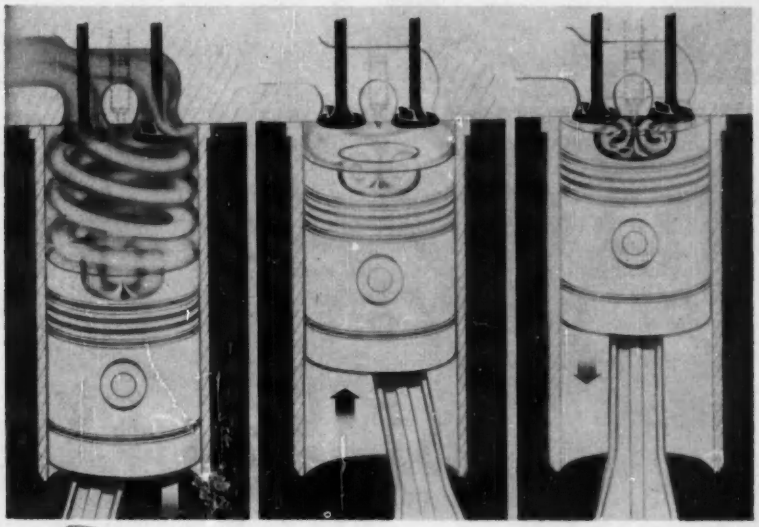
1. Represents power available at full throttle for engines to be installed in off-highway rubber-tired equipment, for excavators and cranes, for stand-by generator sets, light-duty marine, and similar applications. Production engines will produce hp within 5% of values shown.

2. Recommended power to be used for generator sets, rock crushers, asphalt plants, sawmills, feedmills and similar applications.

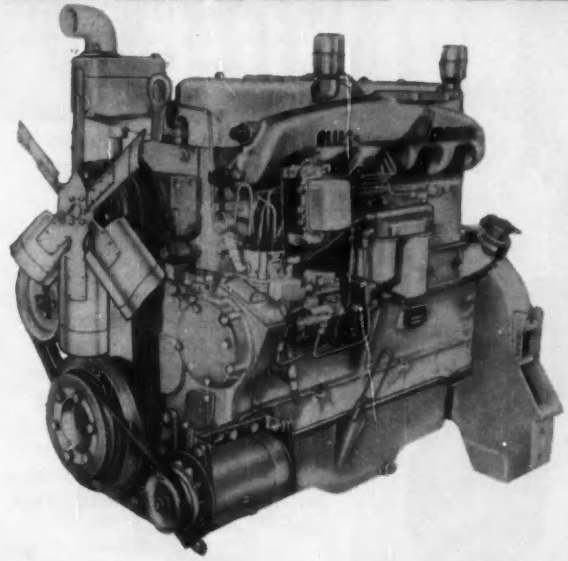
3. Recommended power to be used for driving sustained loads for 24-hr per day operation.

Basic Engine Data

	10000	11000
No. of Cylinders	6	6
Bore, in.	4-7/16	4-7/16
Stroke, in.	5-9/16	5-9/16
Displacement, cu. in.	516	516
Piston Speed, fpm at 2200 rpm	2039	2039
Length, Fan to Fly wheel, in.	53	53
Width	28	29¾
Height	47¾	48¾
Wgt.		10 lb per hp approx.



Combustion system as developed for twin-intake valve 16000 and 21000 models applies for new models having single masked intake valve. Left, porting and mask on valve create intake air swirl. Center, compression intensifies swirl and as piston approaches TDC, head and flat piston area create squish. Right, fuel is injected into violent air turbulence in piston cavity.



Naturally-aspirated 10000 model. American Bosch PSB distributor-type injection pump; Robert Bosch nozzles on both models. Fuel filtration by Commercial Filter.

goes to the direct-injection, "power crater" combustion system. Allis-Chalmers describes it as having "controlled turbulence" that provides smooth, clean burning.

Sequence of events in the combustion system is shown in the drawing which, incidently, is for the 16000 and 21000 engines. The smaller engines are so new that no drawing was available. However, the principle remains the same. One mechanical difference is that in the new engines a single large intake valve is used, rather than the two shown.

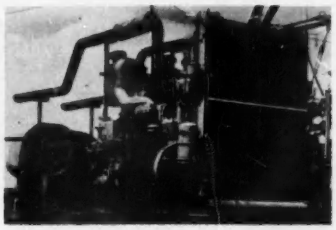
Turbulence is the result of porting design in the cylinder head, use of a masked intake valve and design of the piston, the head of which contains the crater-shaped combustion chamber. Directional porting and the masked valve give incoming air a good swirl. This is intensified as the piston starts up on the compression stroke.

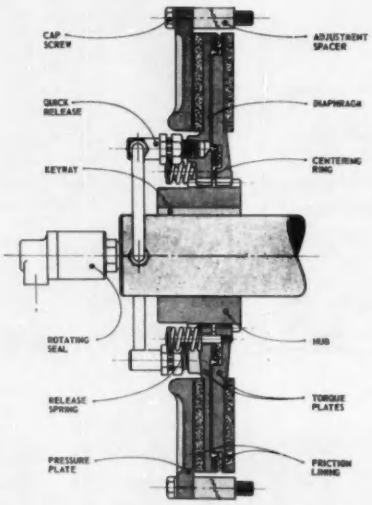
The combustion chamber is concentrated in the center of the piston head. This leaves a broad annular surface around the chamber. The cylinder head surface is flat and with the piston at the top of its stroke, there

(*Continued on page 43*)

diesel power

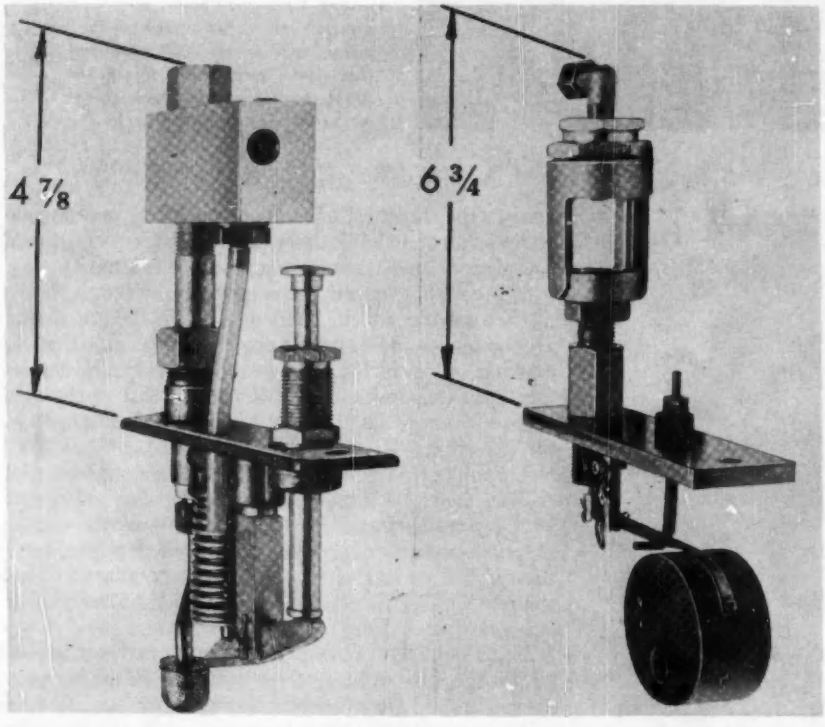
new products





Handles High Torque . . . Fits Inside SAE No. 1 Flywheel Housing!
"Power-Flo" air-operated clutch and brake from Mid-States Industrial Clutch Company, Inc. offers many features . . . self-centering mechanism that reportedly eliminates internal clutch drag on release . . . high-temperature silicone diaphram designed for toughest jobs . . . out ide pressure plates for better heat dissipation . . . fiberglass reinforcement for higher strength. Mid-States compact Model 16S350 single-pla e friction clutch is designed to handle torques from as high as 600-hp engines . . . yet fits inside SAE No. 1 flywheel housing. GM Twin 6-110 die el; (picture left) powering drilling rig, have two 16S350 "Power-Flo" clutches aboard . . . in service two years this month!

440



Automatic Controls Do The Job!
Couple of excellent automatic controls for your lubricators from McCord Corp. Visual Oil Flow Control (right) extends time be ween lubricator fillings. Ties into main engine gear pump to receive filtered oil from crankcase. Number of oil drops that appear in input sight glass are directly proportional to total number of drops being taken out by all the lubricator feeds. McCord's Lub-Sentry (left) is a standard lubricator feed, circulating oil through a contained pressure valve. Oil returns to reservoir via a relief valve, discharging at 100 psi. If lubricator stops or due to mechanical failure lacks oil, pressure drop in valve orifice actuates switch to sound alarm.

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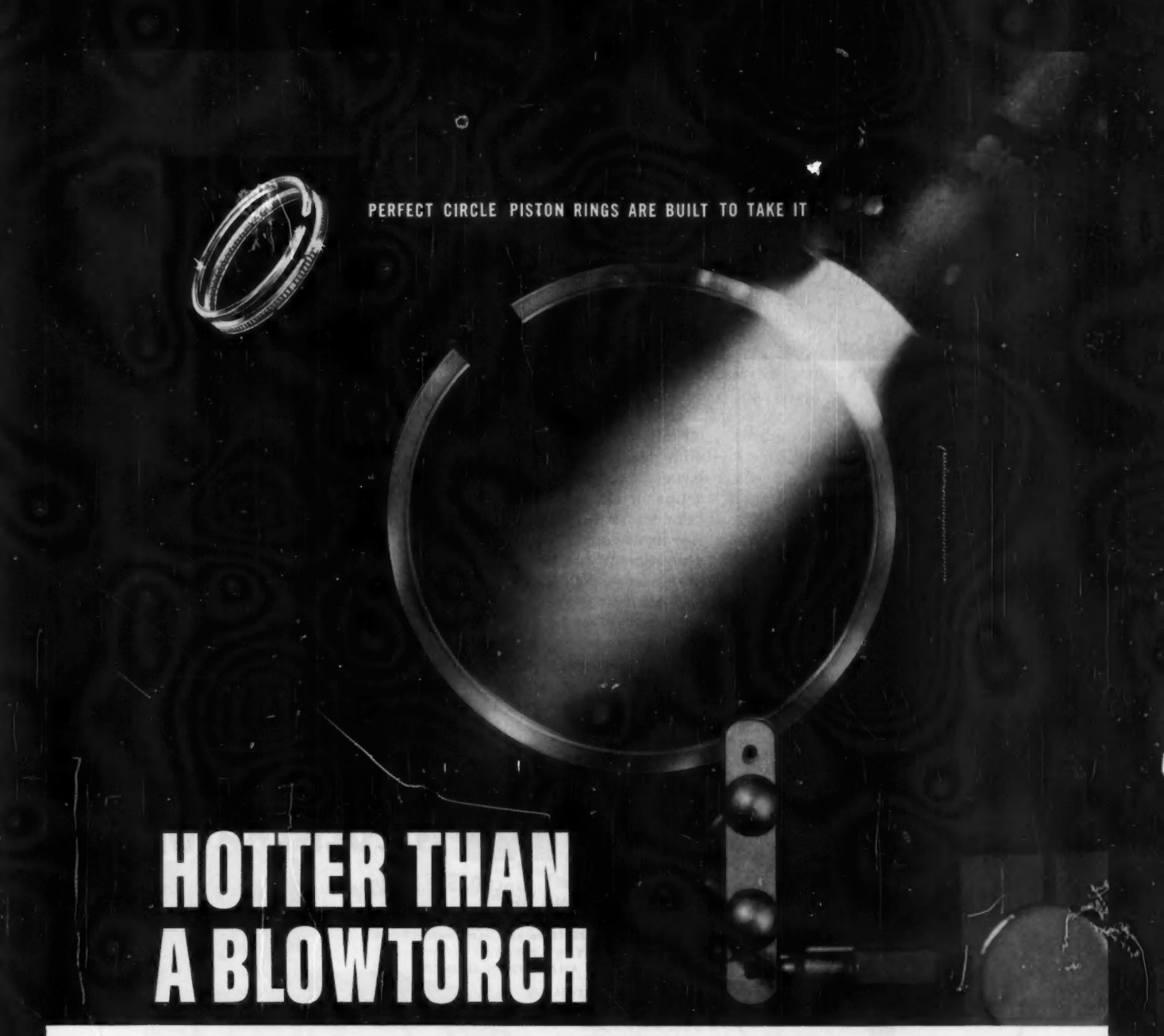

The searing heat that's created inside engine cylinders causes inferior piston rings to lose their strength and resilience, and wear out far before their time. That's why Perfect Circle employs special metallurgical skills to produce ring materials that have the high heat stability needed for long life.

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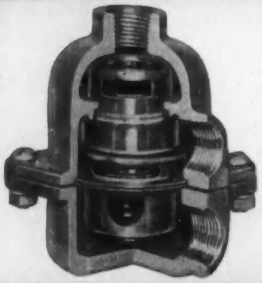

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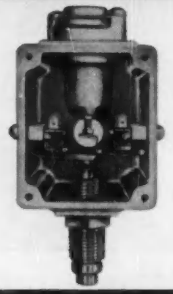
A 3-way diverting valve for controlling water temperature on small diesel and gasoline, marine or stationary engines. Offers many advantages, gives rapid warm up, correct engine temperature under all loads. Made in solid marine bronze or cast iron construction in pipe sizes ½" to 1½", with temperature settings from 75° F to 205° F. For fresh or salt water operation.



Dual Action Switch
MODEL 2340 SAFETY CONTROL SWITCH FOR DUAL PROTECTION

Used to sound an alarm, flash a warning light, or shut down an engine where there is high water temperature or low oil pressure. Pressure setting adjusts from 5-25 psi; temperature ranges from low of 165° F to high of 220° F.

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"Coro Gard" Against Corrosive Action!

Hot caustic or acidic baths for cleaning or rescaling tanks, usually resulting in corrosive action and leaks can be prevented by the use of Coro Gard-1706 Brand coating by the Minnesota Mining and Manufacturing Company.

Use of Coro Gard on interior and all exposed surfaces, will air-cure to a tough rubbery protective film that has good resistance to the corrosive action of chemicals and fluids. It's been found to be particularly effective in its resistance to a 20% concentration of hydrochloric and sulphuric acids, distilled and salt water and alkalies at continuous service temperatures up to 120°F.

Abrasion resistance is excellent . . . coating remains flexible and strong even under adverse weather conditions. Apply with a brush. No special prime needed. Time and costs are low. Will not sag or flow. Remains in position until it cures to a solid rubbery coating.

442

Vibroscope Reports Vibrometer Improvements

Design changes resulting in increased high frequency response and more convenient reading angle are some of the recent improvements made on the Davey Vibrometer Model-I used for vibration testing of motors and other equipment.

Company reports that hand held models are available.

Standard models have full scale readings of .032-in., .016-in., .004-in., and .002-in.

443

Use your dp Reader Service Card.

(Continued on page 46)

KATO A.C. GENERATORS

KNOWN FOR LONG, DEPENDABLE SERVICE!

- CUSTOM ENGINEERED to your exact requirements.
- NOW 500 WATTS TO 1,000 KVA
- ADAPTABLE TO ANY INDUSTRIAL ENGINE

With new rugged E-157 FRAME the Kato Generator line has been extended to 1,000 KVA. Each is built with the same careful craftsmanship and top quality materials for which KATO has been known since 1928.

UNIFORM QUALITY is achieved by constant, thorough supervisory checks throughout production.

LONG LIFE is assured because Kato Generator design and capacity allow for characteristics beyond normal requirements.

ALSO KATO MOTOR GENERATOR SETS, HIGH FREQUENCY GENERATORS, D.C. GENERATORS, ROTARY CONVERTERS, POWER CONVERTING SYSTEMS.

CSA APPROVED

NEW! E-157 FRAME complete with all controls, couplings for the engine of your choice.

Builders of Fine Rotating Electrical Machinery Since 1928!

Write or phone concerning your specific requirements!

KATO ENGINEERING COMPANY

1408 FIRST AVENUE, MANKATO, MINNESOTA—Phone 8-2941

For more information write in No. 420

A-C's New Diesels . . .

(Continued from page 39)

is a minimum practical clearance between piston and head. The two flat surfaces create a "squish" area as the piston approaches top dead center and the air is violently displaced into the center cavity, adding a new dimension to the air swirl.

Fuel is injected downward and outward into the combustion cavity by a 4-hole nozzle. Angle between opposite sprays is 150 degrees; nozzle opening pressure-2500 psi. The highly atomized fuel spray is brought up to combustion temperature rapidly by the hot, turbulent air. Burning starts first on the fringes of the spray and progresses to the main portion of the stream. Main burning takes place just after top dead center. This progression of combustion produces a controlled pressure and the high degree of turbulence insures good fuel/air mixing for smooth, clean combustion.

One difference between these and the earlier 16000 and 21000 models is the location of the injection nozzle. With the dual intakes and single exhaust valve, there was space for central location of the nozzle. In the new engines with their single intake and exhaust valves, it was necessary to move the nozzle slightly off to the side and bring the nozzle through the head at an angle. However, the nozzle tip was tailored to duplicate the earlier spray characteristics. Angular positioning of the nozzle had the advantage of bringing it out from under the valve cover to the side of the head where accessibility was better.

Still another difference between these two engine series is that the new engines with their 516-cu in. displacement are within the capacity of standard distributor-type fuel injection pumps. Where the American Bosch APE Type pump is used on the larger series, the new engines use the American Bosch PSB Type.

A "plus" factor of this whole combustion system is that it provides fast starting even in cold weather. Running at a 16.2:1 compression ratio, with temperatures around zero, starts in a few seconds are obtained with no auxiliary starting aids.

General Engine Construction

Allis-Chalmers was more concerned with structural strength and rigidity than in producing the lightest possible engine. Weight was not the overriding consideration in the expected applications. Yet there was no place in the design for non-working mass. Weight per horsepower for the 11000 engine at top rating is approximately 10 lb per hp.

Ribbing in the alloy cast iron block is designed to carry and distribute evenly all operating stresses. Special attention is given to main journal seat areas to insure rigid support for the crankshaft. This is true for the bore for the camshaft also. Top of the block is relieved from surface stresses caused by cylinder head studs by counterboring the stud holes and starting the threading down in the mass of the ribbing.

The 7-bearing forged crankshaft is fully counterweighted and dynamically balanced. It runs on precision steel-backed aluminum bearings. Full rifle drilling supplies pressurized lube oil to mains, crank pins, and through the drilled connecting rod to the piston pin and underside of piston.

Block bores, lined with solid replaceable SAE-64 bronze bushings, support the forged camshaft. Drive is from a gear on the crankshaft.

Alloy cast iron liners of the wet type are used. The top of the liner features A-C's "flame-guard" shoulder that protects the gasket from direct contact with combustion flame. The lower end of the liner is sealed with two synthetic rubber "O"-rings.

Forged, heavy-flanged connecting rods are used. Bearings are also precision steel-backed aluminum shells. The eye has a steel, bronze-lined bushing. As mentioned, the rod is drilled to provide lubrication to the thick-fall, full-floating piston pin.

Two cylinder heads, each for three cylinders, are used. Valves are operated through the conventional tappet, push rod and rocker arm mechanism. Both valves seat on replaceable inserts. Single springs are used. Since location of the mark on the intake valve is critical to performance, a tab on the lower valve seat, mating with a slot in the valve stem, holding this valve seat, mating with a slot in the valve stem, hold this valve from turning.

A Schwitzer turbocharger is used on the 11000 model. This is water-cooled and lubricated from the engine's cooling and lubricating systems respectively. The exhaust manifold is split ,each part being for three cylinders. The turbo mounts directly on a support pad at the rear of the forward section. Sections are connected with a slip joint to compensate for expansion.

A dual-element (in series) lube oil filter is used on the 11000 model, a single cartridge element on the 10000 unit. Also, an oil cooler is standard on the turbocharged model but optional on the lower-output, naturally-aspirated version.

Applications Projected

Both engines are being built into power units, both open and closed types. Drive is through one of the Twin Disc power takeoffs. Reduction gearing may be included. Package torque converter units are also offered. These drive options make the engine suitable for a broad range of shaft, chain, belt or gear-powered applications. These could be anything from a rock crusher drive to power for a crane or shovel.

The engines are also incorporated in electric generator sets, coupled to A-C's brushless generators. The 11000 engine provides ratings up to 110 kw and the 10000 unit, up to 66 kw.

Power for off-highway equipment is also envisioned. Some of the larger engines have done an excellent job in off-highway vehicles, logging trucks for example. These newer engines are expected to follow suit in applications where their horsepower fits.

Although new to the dealer's floors, prototypes of these new models have undergone intensive field testing in a variety of applications. Plus this, they carry over all the proven principles demonstrated in the earlier models. This "family" of engines, now up to four, should grow both in members of the family and in user acceptance of them.

DIESELS GO!

DIESEL STARTING FLUID INJECTORS

New for '61—the first and only push-button Diesel Starting Fluid Injector with *automatic cutoff*. Install this dependable, low-cost unit on all your Diesels. Eliminate cold-weather down-time—keep engines working a full shift.

A Zero Start Diesel Starting Fluid Injector can pay for itself in just one winter morning. Thermostatic cutoff prevents misuse.

See your equipment dealer now, or write

PHILLIPS
MANUFACTURING COMPANY
8200 Grand Avenue
Minneapolis 20, Minnesota

For more information write in No. 421

diesel power

new literature

Start from Zero!

Phillips Manufacturing Co.'s new starting fluid is safe and sure with automatic shut-off preventing misuse and harm to pistons and cylinder walls.

Zero Start ether-base diesel and/or gasoline engine starting fluid injector Model E700 is fully described in an illustrated colored catalog.

Model E700 is adaptable to 6, 12 or 24 volts. Operated electrically by a dashboard-mounted push-button control, each push activates an electric solenoid releasing the starting fluid into the intake manifold. The amount can be regulated by a simple solenoid adjustment. Standard aerosol starting fluid cans are quickly and easily changed. Used by operators of trucks, bulldozers, farm equipment, boats, stand-by's.

444

Clark Catalogs Full Torque Flywheel Power Takeoff

Transmission Division of Clark Equipment has described the P-200 flywheel PTO in a new 4-page, 4-color bulletin. The P-200, operable at both full torque and a 1.27:1 ratio, can be used for both diesel and gasoline engines in a large variety of applications including cement mixers, farm equipment, airport refuelers, and other industrial equipment.

It eliminates auxiliary engine and other complicated and expensive systems, yet adds just a few inches to the power plant.

Bulletin is illustrated with photographs and scale drawings showing dimensions and a cut-away drawing of the arrangement of gears and shafts.

445

Condec Power Units Featured

Consolidated Diesel Electric Corporation describes a complete line of engine-driven electric generating systems in an eye-catching red and white catalog, "Power Units".

Generator sets from 10 to 200 kw are available for use either as primary power sources or as standby emergency power supplies.

Bulletin also describes Condec's Uninterrupted Power Supply for critical applications; power units for use in tough environmental conditions; and an automatic power system for use where continuity is a MUST.

446

Read All About Electric Tachometers!

Electric tachometers, requiring no batteries or external power sources are described in a recent bulletin issued by the Electro-Mechano Co. On the spot speed measurements are accomplished by a generator which can be connected to the shaft to be measured and an RPM or FPM electric indicator.

Bulletin T-101-50 catalogs the Electro Mechano tachometers available in a variety of models and suitable for stationary and transport engine testing. As they consist of two units, they are particularly useful where the indicator is to be located a distance from the point of speed measurement.

447

Aeroquip Publishes Hose Style Selector

An alphabetically arranged guide of industrial hose styles has just been released by the Aeroquip Corporation. No matter what the industrial application, this easy-to-read, 12-page, two-color booklet lists 112 separate liquids and gases, beginning with acetate solvents and ending with zinc salt solutions.

Suitability of Aeroquip Hose tubestocks for use in carrying these diverse agents is charted in four classifications from excellent to unsatisfactory. A separate chart provides fundamental information about the pressure, temperature and size limits of the individual hose types. This 'guide' was prepared for

use by maintenance supervisors and designers concerned primarily with hose selection problems. It's an important excerpt of information already appearing in Aeroquip's Industrial Catalog #250.

448

Thinking About Pumping?

If you've got pumping on your mind, and need a good guide, look into the Standards of the Hydraulic Institute, now in its tenth edition.

Included in the 75-page looseleaf volume are centrifugal, rotary and reciprocating pumps. Each section covers nomenclature, hydraulic standards, test methods and installation and operating hints. Published in 1955, revisions of certain pages have just been made available making the entire publication up-to-date. The price, including the revised pages . . . $6.00.

449

How About Diesels For Small Trucks?

The BIG question of whether or not operators of small trucks should convert to diesel for greater profits is taken up in a new booklet: "Why Diesels for Small Trucks?" published by Detroit Diesel Engine Division of GM, manufacturers of Series 53 small-truck Diesels.

Full of actual reports from operators who've already switched to diesel, the booklet contains a series of charts covering price, fuel and maintenance savings, yearly return on investment and other factors.

Small truck operators can figure out increased profits they can expect on their own operation by converting to Series 53 Diesels just by means of these charts.

This one's a good one for all small truck operators to study.

450

Sun Oil Off-Highway Products Described

Industrial Products Department of Sun Oil Company has prepared a new booklet describing the company's complete new line of diesel and gasoline motor oils, gear lubricants, transmission fluids and greases. Booklet is in easy-to-read chart form, illustrated and in three colors.

451

Use your dp Reader Service Card.

Polymer's Nylaflow Hose Described

NYLAFLOW nylon pressure hose, a product of the Polymer Corporation with all its reusable fittings and a hose selector, is talked about in their new bulletin.

The new hose is available in burst-pressure ratings of 5000 and 8000 psi, in inside diameters from ⅛-in. to ½-in. Instructions for applying fittings and information on ordering assemblies is included.

452

Airco Brochure Issued

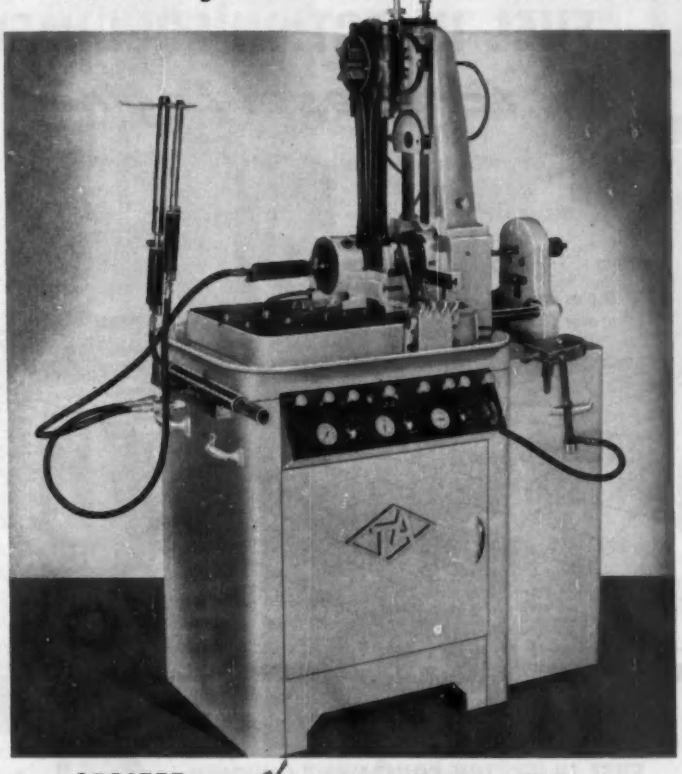
Airco, a division of Air Reduction Company, has published a new 12-page color brochure illustrating its flame hardening equipment.

It's all there and discussed, from standard heating torches and tips and water-cooled flame hardening torches, to gear hardening equipment. Use with the Number 20 Radiagraph, a portable machine carriage ideally suited for flat surface and gear hardening operations.

453

New TOBIN-ARP

Diamond Boring PIN FITTING MACHINE



GREATER ACCURACY THAN EVER BEFORE

✓ Faster, cuts job time one-third

✓ Added rigidity for superior performance

✓ Adds profits to every engine rebuilding job

Write today for complete information

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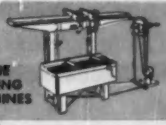


For more information write in No. 422

(Continued from page 42)

New Plastic Filter Sponges up the Dirt!

American Air Filter has developed a new unit air filter, employing a single sheet of synthetic plastic material. Foamat is sponge-like in appearance, breaks an air stream into little jets as it passes through the filter preventing dust and dirt from following as great quantities are trapped in the cells. Designed as a permanent filter, it will not pack, settle, separate or develop 'thin' spots.

No media replacement necessary. Maintenance greatly reduced. Wash it with a standard spray-lead hose nozzle without removing it from the filter bank.

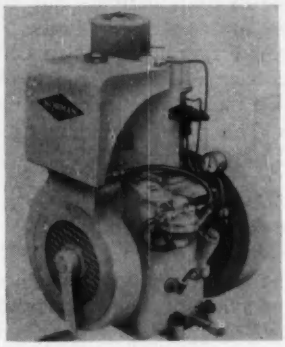
It's pleated into a holding frame, allowing the greatest area for dirt storage. Resists all moisture and vermin. Chemically treated for flame resistance.

454

Lightweight Economy Diesel From Trans-World Trade

An aircooled utility Diesel engine designed for industrial, marine and mining industries has been introduced by Trans-World Trade.

The Norman Engine is a single cylinder, cold starting, light weight diesel featuring high quality British craftsmanship. The 4-cycle engine with indirect injection (with vertical air cooling) bears the Sanders patented high efficiency combustion chamber.



Reportedly economical to operate, providing more output per dollar than any comparable engine now on the market, it is 233 lb in weight, 18 by 31 by 20 in., with an engine speed 1500 to 1800 rpm and a maximum bhp of six. Torque is 17.5 ft lbs.

Equipment includes fuel tank, exhaust silencer, air and fuel filters and manual starter. Standard spare parts, tools and operator's handbook are furnished.

Optional extra equipment includes electrical starter, Duplex-Vee Pulley (8-in. P.C.D.-2 groove, 5/8-in. belt) extension shaft, flexible coupling, crankshaft guard, lubrication filter, oilpressure gauge, marine accessories and spares for one to two years of operation.

455

In case of EMERGENCY . . . new Katolight Generating Set

Katolight's new 125-kw generating set, driven by a V8 Roiline engine can be equipped with a natural gas carburetor. It's especially developed to meet emergency needs in modern industrial plants, hospitals, etc.

456

The World's Largest Manufacturers of
FUEL INJECTION EQUIPMENT
for Diesel Engines
Depots and Service Agents
in over 100 Countries
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Head Office: 501 West 42nd Street, New York 36
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Branch Offices:
171 Beacon Street, South San Francisco, San Francisco, California
5001 West Belmont Avenue, Chicago 41, Illinois
400 South Edgewood Avenue, Jacksonville, Florida
Canadian Distributor: Joseph Lucas (Canada) Ltd.
Head Office: 11 Davies Avenue, Toronto 8, Ontario
Branch Office: 3401 St. Antoine Street, Montreal 30, Quebec

For more information write in No. 423

Efficiency-Plus with 2-Speed Refrigeration Unit

New diesel engine/generator by Electric Machinery Manufacturing Co. designed for railroad cars carrying produce and frozen foods, uses self-regulating two-speed unit to drive the refrigeration system.

The two-speed unit reduces the cost of refrigerating railroad cars, since the unit automatically adjusts the car temperature to the extremes outside.

The two speed generator employs a single voltage, requires no external devices to boost voltage and requires no brushes, thereby eliminating the need for adjustment or replacement of brushes which are the major maintenance problems.

457

Even at Low Speeds . . . New Generator Overdrive Increases Generator Output

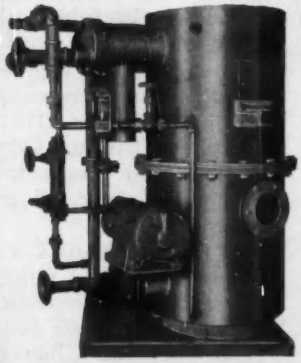
Consolidated General Products has announced an improved model of the "Gen-O-Drive" Generator Overdrive to increase the output level of automotive generators at low speeds.

Applications include use on vehicles where excessive battery drain is a problem due to sustained low-speed driving or idling, or where extra electrical equipment, such as two-way radios call for more current. It's available to fit practically all automotive generators and in seven belt sizes: ⅜-in., ½-in., ⅝-in., ¾-in., 15/16-in., 1-in., and 1-1/16-in.

458

Use your dp Reader Service Card.

FRESH WATER
FUEL FREE
WHEREVER YOU HAVE A DIESEL
WITH THE NEW
AMF-MAXIM
AQUAVAP
HEAT RECOVERY EVAPORATOR



- A COMPLETE PACKAGED UNIT
- USES ENGINE JACKET WATER AS ITS HEAT SOURCE
- FRESH WATER FROM SALT OR BRACKISH WATER
- SIMPLE TO OPERATE
- INEXPENSIVE TO MAINTAIN
- LOW INITIAL COST

This new line of AMF-Maxim Heat Recovery Evaporators depend on engine jacket water, or any other hot water, as a heat source. Ranging in capacity from 150 GPD (which can be produced from a 30 HP engine) to 12,500 GPD, they are ideal for fresh water production wherever diesels are in use in locations that have some source of raw water, salt or brackish. Purity of water produced exceeds U.S. Dept. of Health requirements. Other AMF-Maxim Evaporators are available with capacities ranging up to more than 1,000,000 gallons per day.

For further information, write AMF-Maxim Evaporator Division at the address below.

AQUAVAP MEANS FRESH WATER FOR:

OFFSHORE OIL DRILLING

LAND-BASED OIL DRILLING

MINING

WORKBOATS

YACHTS

COASTAL RESORTS

REMOTE MILITARY INSTALLATIONS

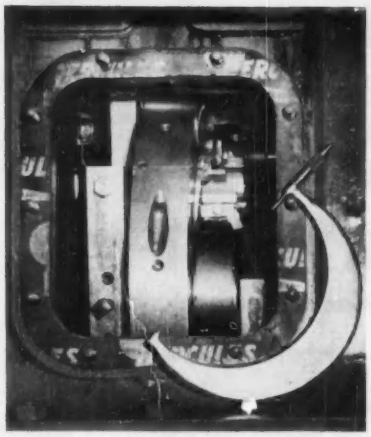
CONSTRUCTION CAMPS

Sales and Engineering Representatives throughout the nation.

MAXIM EVAPORATOR DIVISION
AMERICAN MACHINE & FOUNDRY COMPANY
6 MILL LANE, WATERFORD, CONN.

For more information write in No. 424

WE'VE OPENED THE DOOR TO GREATER SAVINGS BY BRINGING OUR SERVICE TO YOU



Precision crank pin refinishing in place!

The small engine crank pictured above was restored in close quarters without dismantling. Our portable machines can solve your problems and save you money. Crank pins from 6" through 18" in diameter accurately refinished in place. LET US HELP YOU MINIMIZE DOWN TIME.

Damaged flywheel fits and key ways refinished in place. Bearing seats line bored and bushed to standard diameters on location. Our portable equipment is available for many other types of field repairs.

We have available facilities for transporting our equipment and personnel to most parts of the Western Hemisphere.

All types of marine and heavy power plant equipment serviced with special attention given to emergencies.

Crankshafts of any size or type completely refinished in our plant. We have the experience of more than half a century in successfully restoring broken and damaged shafts to service.

We welcome inquiries on maintenance problems requiring precision methods.

WASHINGTON IRON WORKS, INC.
Established 1876
SHERMAN, TEXAS
Pho. TW—2-8145

For more information write in No. 425

PEOPLE AND PLANTS

(Continued from page 19)

Amot Sales Manager Completes Extensive Sales Trip; Johnson Named Sales Engineer

Charles R. Carmichael, sales manager, **Amot Controls Corp.** has completed an extensive trip that took him to various places using Amot installations, including Tulsa, Oklahoma City, Cleveland, Odessa and Columbus. He conducted sales meetings and inspected customer exhibits as well.

Mr. Carmichael used a display board set up so that various units are operative and show actual functions with the controls in use.

Amot president, **Elton B. Fox,** has made known the appointment of **Harold P. Johnson** as sales engineer. He was with the Ross Heat Exchanger Division of American-Standard as Western District Sales Manager, prior to his affiliation with Amot early this year. He will be involved with the company's sales and service policies.

D. Salls

Salls To Manager C-B as Sales

David Salls, formerly manager of **Cooper-Bessemer's** Gas Turbine Sales, will take over as Manager of Gas Industry Sales, according to an announcement by **Grant C. Woodward,** vice-president, marketing. His office will be in the company's Mount Vernon, Ohio headquarters.

USE BELL INJECTOR CUPS
FOR THE LEADING TRUCK DIESELS
Years of proven service
Volume production on automatic machines means SAVINGS
We pass this on to the consumer
Sold by all parts houses
BELL DIESEL RESEARCH
Pioneers in research and manufacture of high speed diesel injection equipment.
P.O. Box 842, Glendale 5, Calif.
Telephone: Citrus 1-4721

For more information write in No. 426

IMPORTED EUROPEAN FACTORY AUTHORIZED DIESEL PARTS
• PISTONS • GASKETS • BEARINGS
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Immediate quotation on specific inquiries.
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For more information write in No. 427

HUGE INVENTORY OF WAUKESHA ENGINE PARTS
ORDERS SHIPPED SAME DAY AS RECEIVED
JULIUS BINDRIM, INC.
BROOKLYN 38, N. Y.
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For more information write in No. 428

FULTON SYLPHON SAFETY CONTROL—MODEL 530 BRAND NEW . . . $55.00!

Government Surplus, BRAND NEW, in factory packages. List Price $125.00. Provides positive protection against high water jacket temperature and low lubricating oil pressure. Adjustable temperature cut-off range 180-210 degrees; max. oil pressure 75 lbs; adjustable cut-off range 2-25 PSI. Automatically shuts off engine fuel oil supply and drains fuel line between shut-off valve and injection pump. Supplied with 6' long tubing to temperature bulb. 11" h., 6" w., 2¾" deep. Shpg. wt. 12 lbs. FOB Chicago.
No AN863 Our price **$55.00**
(Quantity price 3 for $150.00)
Write for **Free CATALOG** of pumps. Generators, Hydraulic Machinery and Genuine CATERPILLAR, INTERNATIONAL HARVESTER and LETOURNEAU Spare Parts.

GROBAN SUPPLY COMPANY
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CHICAGO 5, ILL., U.S.A. WEbster 9-3793

For more information write in No. 429

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COMPANY OR ORGANIZATION _____

STREET _____ CITY _____ ZONE _____ STATE _____

My Business Is

- ☐ Construction & Earthmoving
- ☐ Petroleum, Production & Pipeline
- ☐ Highway Transportation
- ☐ Railroad Transportation
- ☐ Lumber & Logging
- ☐ Mining & Quarrying
- Other (explain) _____
- ☐ Municipal Power Plant
- ☐ Utility Power Plant
- ☐ Consulting Engineering
- ☐ Engine or Equipment Manufacturer
- ☐ Engine or Equipment Distributor
- ☐ Engine or Equipment Service and Repair

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Permit No. 638
Stamford, Conn.

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FIRM _____
TYPE OF BUSINESS _____
STREET ADDRESS _____
This is my home address ☐ Office address ☐
CITY _____ ZONE _____ STATE _____

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PLEASE PRINT READER SERVICE NUMBERS HERE

I'd like more information on following article:

NAME _____ TITLE _____
COMPANY OR ORGANIZATION _____
STREET _____ CITY _____ ZONE _____ STATE _____

My Business Is

- ☐ Construction & Earthmoving
- ☐ Petroleum, Production & Pipeline
- ☐ Highway Transportation
- ☐ Railroad Transportation
- ☐ Lumber & Logging
- ☐ Mining & Quarrying
- ☐ Municipal Power Plant
- ☐ Utility Power Plant
- ☐ Consulting Engineering
- ☐ Engine or Equipment Manufacturer
- ☐ Engine or Equipment Distributor
- ☐ Engine or Equipment Service and Repair

Other (explain) _____

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2 Then, write the numbers in the boxes on the card.

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DIESEL POWER
PUBLICATIONS, INC.
80 lincoln avenue, stamford, connecticut

". . . pickup in construction will result in higher engine sales."

(*Continued from page 23*)

ries, producing crushed stone and aggregates, running sawmills or cotton gins and similar applications are typical.

Aggressive engine dealers have told us of a steady but varied demand for industrial units. There doesn't appear to be any definite category of user. For example, one engine distributor told us about such varied applications as powering a white rat breeding laboratory, providing a generator set for an atomic power project and supplying power to drive a special air compressor for a sonic fatigue testing project.

Recent standby installations by the same distributor list 29 in hospitals alone. It's interesting to note that of these, the bulk are in the 100-kw size or bigger, running as high as 3000-kw units. In general, the capacity of standby generator sets has been increasing steadily.

In most of the other types of applications lumped in this general category, a pickup in construction activity (as is forecast) will result in higher engine sales. As example, increased housing starts will create a higher demand for lumber and pickup in roadbuilding and industrial construction will increase demand for aggregates.

PETROLEUM—As a whole, the petroleum industry is expected to do as well and perhaps a little better in 1961 than it did in 1960. Inventory problems are reported to be in better control. Different phases of the industry will not all fare the same. For example, drilling and production expenditures are expected to ease. Capital expenditure at the refining end will go for modernization and improvement rather than for expansion.

Gas production is expected to be up with a corresponding increase in need for expanded distribution facilities. Diesels figure in the construction phase and natural gas engines in the pumping on new lines or where pipe size is being increased. Where higher through-put is obtained by higher pressures, more pumping power is needed.

Domestic oil and gas production is expected to increase somewhat. Increased activity will boost need for diesels and natural gas engines for services such as pumping and the specialized services like fracturing, water flooding, etc.

MINING—Not much change is expected in demand for diesels in this service. With a general pickup in business, higher demands for basic materials could increase diesel sales. The big question will be whether the increase in raw material requirements exceeds the capacity of existing equipment. For this reason, sales to the industry are expected to be for replacement purposes and where new, improved equipment can reduce production costs.

CONSTRUCTION—Department of Commerce fore-

(*Continued on page 52*)

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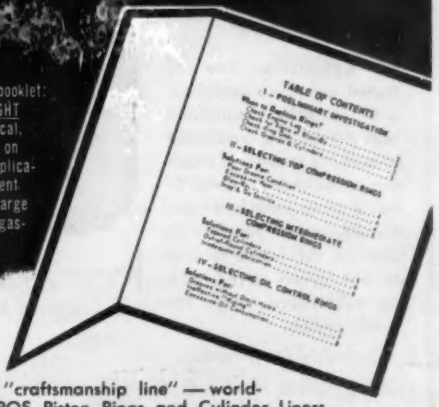

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"... diesel farm penetration is deepening rapidly."

(Continued from page 51)

casts predict a rise to a record $57.3-billion in new construction 4% over 1960. This will top even the 1959 peak year. Even so, this is for all types of construction, some not being particularly fertile fields for diesel usage. Plus this, the percentage of increase in types with heavy diesel usage is fairly small and existing equipment can handle most of it.

Demand for construction equipment is therefore expected to be little changed from 1960. As in the case of mining, replacement needs and the economic attractiveness of improved designs will account for the bulk of sales.

AGRICULTURE—An upturn in farm income is expected this year. As a result of a decline during 1960, many purchases were deferred and should be turned into business this year. Even last year was a good one for the diesel industry despite lower unit sales. Reason is that extent of diesel penetration into farm tractors and powered equipment is deepening rapidly.

The percentage of diesel-powered farm tractors is getting close to the half-way mark. This is a prime example of increased usage and acceptance of small "vehicular" diesels. Incidently, it also follows the pattern of how the small diesel got its foothold abroad, particularly in England. There, farm tractors were nearly completely dieselized when it was decided to try some of the small engines they had developed in road transport. Results have been discussed.

Another factor makes diesel agriculture sales look promising—improvement in distribution networks and better merchandising. Many manufacturers have been pounding away on this and results are already felt and will increase.

Conclusion

We're optimistic about 1961. Actual production and sales potential appear a little better than for 1960 seen in retrospect. It will also be a year when the prospect for small vehicular-type diesels, with their tremendous sales potential, move to firmer ground. While this will account for some diesel sales this year, the major impact of this development will be felt in future years as this field of usage reaches full potential—*and what a potential!*

Meanwhile, today's diesels have more to offer than ever before. Fuel consumption is better across the board. Service life is improved. Cost per horsepower has been controlled and in some cases actually reduced as a result of design for higher specific outputs, effect of increased production volume and lower cost for fuel injection equipment. Flexibility and versatility of application has been increased. And parts and service availability has been improved. In short, they're a good buy and should sell in 1961.

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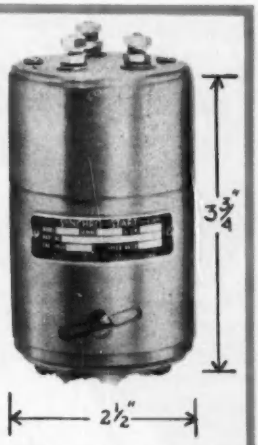

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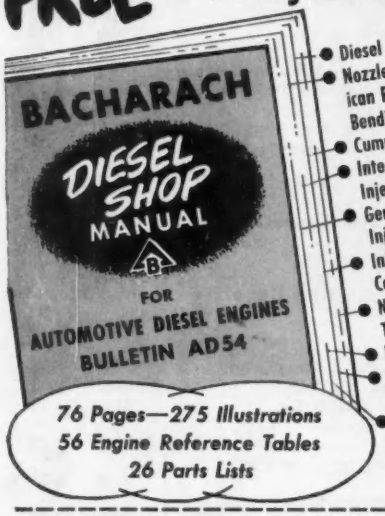

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